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ILLUSTRATIONS.

Street Architecture, London: Messrs. Cassell, Petter, & Galpin's New Premises, Fleet-lane (Plan, 752).—Mr. Francis Chambers, Architect 754

St. Sepulchre's, Holborn-viaduct: Tower and Porch, as Restored by Mr. W. P. Griffith, F.S.A., Architect 755

CONTENTS.

Light in London 743
Professional Papers on Indian Engineering 744
Some Notes on the Early Use of Portland Stone and other Building Materials 746
British Archæological Association at Evesham 747
Opening of the Firth Park, Sheffield 748
East Grinstead 748
New Workhouse at Shields 748
Income and Expenditure of the Corporation of London 748
An Architectural Notice of St. Sepulchre's Church, London, and of its Restoration 749
Or San Michele 750
Discovery at Lavenham, Suffolk 751
Sales of Freehold Estates and Building Land 751
A New Model Printing-house 751
The Contract for the Lambeth New Infirmary 752
Warrington School of Art: Proposed New Building 752
On Hammers 757
The Public Health of Towns 758
Underpaid Surveyors 759
Public Improvements at New Mareko 759
Sanitation of Houses 759
Redcar Racecourse 759
Decoration of St. George's Hall, Liverpool 759
Competitions 760
London School Board Schools 760
The Bainbridge Memorial Chapel, Byker, Newcastle-upon-Tyne 760
Horticulture at the International Exhibition, Philadelphia 760
Bridport School of Art 760
Cases under Metropolitan Building Act 760
Church Building News 760
Height of Rooms 761
Recovery of Commission for Sale: Thornhill v. Carter 761
The Population of Tyndall's Buildings 761
Miscellanea 762

Light in London.

GOOD roads are, so to speak, the *backbone* of commerce. A town without the solid framework of well-paved streets, to connect its extremities, is a topographical jelly-fish, a mere polype of a city. But not only do roads make a commerce, but commerce, innately *polite*, returns the favour, and makes roads.

Good lighting, however, is as essential to the welfare of a town as good paving. The latter breeds intercourse, the former security of life and property. Without light vegetables grow white and sickly; in darkness *animals* prey. What the stars are to the seafarer the street-lamps should be to the wayfarer,—shining finger-posts, to direct him in his course.

Continuing amongst the marvels of London, we now purpose making a rough estimate as to what is the extent and cost of the entire lighting appliances of this great metropolis,—what the total number of gas-jets fringing its 2,500 miles of streets, like the string of illumination-lamps which border the gravel-walks of the gardens at some suburban place of amusement on a "gala night"; what the united length of the gas-mains buried, like a huge knot of lob-worms, in the soil beneath its thirty-seven millions'-worth of pavement; what the aggregate quantity of gas which is consumed in making the monster capital shine every night, as if it were the decomposing body of some enormous leviathan of the deep, glowing with all the phosphorescence of that wondrous process of *cold* combustion known as "natural decay"; and what the gross cost, or, rather, what the gross amount of money which is *burnt* night after night in the collective street-illumination of London,—ay, burnt as consummately as if the whole of the gold had been blown into the air, in fire-dust, in the form of some brilliant pyrotechnic display.

Let us premise, however, that those who have seen London in the day-time only, with its flood of life streaming through its bricken veins to its restless stony heart, know it not yet in *all* its grandeur and solemnity. They have still, in order to comprehend the multiform sublimity of the great city, to contemplate it by night; under its different aspects. And, more particularly, far off from an eminence—such as Highgate-hill, or Hampstead-heath, on a bright winter's evening; for then, though the stars be shining in all their infinite numbers in the cold clear vault of the heavens above, there is another firmament spread out on the earth below, with its millions of brilliant points of light glittering, like a carpet of constellations, at the feet. Line after line of the long avenues of lamps sparkles in thin fibres of flame, like the trails left by November meteors, cutting and crossing one another till they are lost in the haze of the distance, so that the whole seems as though it were a net-work of fire, or some vast spider's web covered with countless specks of hoar-frost which are all aglow in the rays of the morning sun. Over the brilliant plain, too, there hangs a large lurid cloud, red and luminous as if the monster metropolis were in flames; and looking from afar as though it were one of those huge "fire-mists," or *nebulæ*, out of which the elder Herschel fancied planets to have been consolidated.

Again, it is at night that the strange anomalies of London life are best seen; for it is when the hum of life in the great city grows faint as the murmur of a sea-shell in the ear, and the shops darken, and the glaring gin-palaces thrust out their ragged and squalid crowds to pace the streets, that London puts on its most solemn look of all. On the benches of the parks—in the niches of the bridges—and amid the litter of the markets, or else all along some "hot-wall" at the sugar-bakers', are crowded (we can hardly say nestled), the homeless, shoeless, and penniless. There, on a doorstep, may be, doses some wretched tatterdemalion child whose day's begging has not brought him enough to pay even for the twopenny "doss" to which his young companions in misery have long since gone whistling off; and where the paving-stones have been taken up and piled high in the roadway, while the mains or the sewers are being mended, and the gas streams from the tall iron pipe in a long flag of flame, there a ragged crowd is gathered round the glowing-red coke-fire—some smoking, and some half asleep as, with outstretched hands, they stay to warm themselves beside it until the policeman comes round.

Then, as the lamps are put out one after another, and the streets grow steel-blue with the coming light, and the church-spires and roof-tops begin to stand out against the clear sky, with a sharpness of outline which in London is seen only before its three or four million of chimneys have thrown a pall of smoke over the town—then come shuffling and yawning forth the unwashed and unkempt poor; some with greasy wallets at their back, to hunt over each dustheap, and eke out lives which one would hardly think worth the eking, by seeking refuse bones, rags, and bits of old iron. Others, again, on their way to their work, stop at the corner of some street to refresh themselves with a cup of hot coffee, and there they stand grouped round the early breakfast-stall, blowing at the steaming saucerfuls of the mysterious black liquid drawn from the tall tin-cans, which have the redhot charcoal shining, like discs of crimson foil, through the holes in the fire-pan beneath; whilst already the little slattern girl, with her ragged "shallow" slung before her, goes screaming "Water-cresses"! through the still-sleeping streets.

Such is a rough pen-and-ink sketch of the grim and picturesque features of London by gas-light; and now for a jotting, historically traced, of the salient points of the metropolis before gas was thought of.

It was not till just upon 200 years ago that the City was *even partially* lighted with lamps; for in 1694 the "Orphans' Fund" was established, and by the Act of Institution we find that the sum of 600*l.* per annum was assigned towards that fund, as arising from a lease granted by the Corporation of London for twenty-one years, concerning "certayne lyghtes to be kept burning in y^e^ Stretes of y^e^ Citie." The City authorities would appear in those days to have derived a revenue from delegating the privilege of public lighting to private individuals, who must have obtained their remuneration from the householders.

Then in 1716 (on the expiration of the aforesaid lease) an Act was passed ordaining that every citizen should hang out a "lanthorne" before his door, with oil and sufficient cotton wicks to it to burn from six in the evening till eleven at night,—though even this rude form of street illumination was allowed to be discontinued between "ye seventhe nyghte after each and everie new moone, and ye thirde nyghte after ye moone was atte ye fulle"; whilst those who failed to hang out such "lanthornes" on all other nights in each month were to be fined the sum of 1*s.* for each offence.

A few years after this, however, a company seems to have been established which, in return for the munificent stipend of 6*s.* a year, to be levied from each and every householder "in y^e^ Citie rayted for y^e^ support of y^e^ poore," engaged to provide a sufficient number of lamps, and to keep them "ryghte well lyghted" from six p.m. till midnight,—the company undertaking on its part to pay, in consideration of the privilege of taxing the citizens to this extent, the yearly sum of 600*l.* before mentioned to the aforesaid Fund for the orphans.

Nor was it till the year 1736 that the Corporation itself was empowered to set up as many public lights as might be deemed necessary, and to keep them burning throughout the year "from the setting till the rising of the sun"; in return for which boon the City authorities were allowed to levy an annual rate upon each householder, according to the value of his premises. So thoroughly, too, was the work considered to have been done, that for seventy years afterwards, we are told, London was held to be "the best lighted city in all Europe"—though what the state of street-illumination in the other European cities could have been, those who can remember the "darkness made visible" by the oil-lamps burning till the year 1825 in Portman-square may be able to imagine.

Of gas companies the first chartered Corporation is known to have been instituted in the year 1812; but London was not even *partially* lighted with gas till some three or four years afterwards—nearly a century subsequent to the date (1739), when Dr. Clayton is said to have *first* evolved "spirit, black oil, and phlegm," from the destructive distillation of coal—the said spirit being the "inflammable air," as it was afterwards termed, and collected in bladders, so that it might be burnt "by pricking holes in them"; whereas the so-called "black oil" was the coal tar, and the aforesaid "phlegm," ammonia-water.

Still, it was not till nearly the end of the last

"year-hundred" that Mr. Murdock, of Redruth, in Cornwall, applied this same "spirit" to the purposes of illumination, and having collected it in a gasometer, with pipes and jets attached, lighted up his house with the "air"; after which Messrs. Boulton & Watt, in 1798, engaged the ingenious Cornish engineer to illuminate their works at the Soho Foundry, in Birmingham, by the same means. Then the success of the Warwickshire experiment induced Messrs. Phillips & Lee, of Manchester, in 1805, to instruct the same gentleman to set up 1,000 burners in their cotton-mill.

But though, after this, the "inflammable air" gradually got to be regarded as the best means of illuminating large factories, where there was plenty of ventilation, still the noxious smell which accompanied it (owing to the then-defective method of purifying it), the headache and nausea which attended the burning of it in close rooms, as well as the smoke and dirt caused by it (owing to the rude construction of the jets) not only prevented the new mode of illumination being forthwith generally adopted in houses, but the explosive character of the agent caused it to be regarded as of so highly dangerous a nature that it was not till some years later on (1807-9) that it came to be used even as a means of street illumination. For the then-most-eminent chemist of the day, Humphrey Davy, having declared that if public gas-works were set up in London, a mound of earth as large as Primrose Hill would not be sufficient to prevent the danger of the gasometer exploding, it required all the energy and zeal of Mr. Winsor—a speculative German, who took the matter up, and proposed to establish, upon the "inflammable air" principle, a "National Lighting and Heating Company,"—every 5*l.* share of which, it was asserted in the prospectus, would infallibly insure to each shareholder an income of 550*l.* per annum!—it required all the energy and zeal of such a man, we say, not only to raise as much as 50,000*l.* towards so apparently madcap and incendiary a scheme; but, even when sufficient capital had been got together for the purpose, to induce the authorities to allow him to light up Pall Mall with such a foul, fetid, and fatal compound. However, the German had a large stock of patience and perseverance, and at length, in the year 1809, this, the first great street in London, was lighted with gas—to the wonder of all London, and all the world besides. And no sooner was it a *fait accompli* than the new method of street illumination spread—literally like wild-fire—from one parish to another, till, in a few years, the Metropolis really became "the best-lighted city in Europe."

But who thinks of the wondrous novelty of gas now?

Artificial light and heat are such common appliances in these times—from a lucifer-match to that elegant chemical ingenuity, a Döbereiner's hydro-platinum lamp—from a baby's food-warmer to an oxyhydrogen gas-furnace—that those who are nowadays accustomed to play with combustibles almost from their childhood, can hardly understand how difficult it must have been to have kindled the *first* flame; or how fire should in the earliest ages have been looked upon with such sacred awe as to have become an object of positive worship.

Tradition refers the origin of artificial light to a tree having been struck by lightning; but whether this be fable or fact, the power of dispelling darkness by other than natural means must assuredly have been an accidental discovery, rather than an excogitated invention. Savages are known to obtain a light by rubbing two pieces of wood together; but let even civilised people try to produce a flame by such means, and they will soon find the extreme difficulty of the task; so that it is no wonder that in the literally "dark ages," when a light had, by some marvellous means, been once obtained, it should have formed part of almost every early religion to keep it perpetually burning; or that the ancient Mythologists should have instituted a special corps of virgins, called "Vestals," to maintain the sacred lamps, as well as the sacred fire on the altar, in a state of continual ignition. The monkeys in the forests are wont to come down from the trees and warm themselves at the fires which the woodmen have lighted, and left smouldering behind them at nightfall; but never one of the four-handed brutes has been known to have sense enough to put a single log on the burning fagots, in order to prolong the pleasure of the artificial heat.

Light and heat are almost inseparable, and yet there *are* such things as *cold* flames; as in the sheen of the glow-worm and the jewel-like splendour of those winged little *cold* sparks, the fire-flies.*

Still, artificial light is well-nigh invariably the result of rapid combustion; so that with each of the higher degrees of heat some specially-brilliant colour is associated; as, for instance, the bright cherry red, which marks a temperature of 1,200° F.; the glowing golden-orange, which is the hue of heat at 1,700°; the glittering primrose-yellow, which is the luminous lustre of 2,500°; and the dazzling white, which is like a snowball of fire,—the blindingly-brilliant light which accompanies a temperature of 3,300°. Whether what chemists call "*erema-causis*," *i.e.*, the process of burning by *slow degrees*—the gradual oxidation which attends natural decomposition—has any light and colour essentially connected with it human eyes will probably never be able to detect. But, despite the apparent anomalies of phosphorescence, and, so to speak, the "optics of caloric,"—the transparency of certain luminously-opaque bodies to heat, and the opacity of other luminously-transparent ones to it—as evolved by Melloni; all light, natural as well as artificial, seems to be the "necessary consequence" of heat; for astronomers talk of the combustion of the orb of day as if it were an ordinary charcoal fire; and have even begun to calculate how long the fuel in it will be likely to last—the same as, a few years back, geologists were wont to do as to the coalfields of this country. The elder Stephenson delighted to call the warmth and illumination produced by burning coal so much "bottled sunshine"; and there can be no doubt that the heat and light which we now obtain from our Wallsend, Silkstone, and other forms of fossil carbon, were absorbed from the rays of the sun which illumined the vast primæval forests of this island countless ages before the foot of man ever trod the earth. A burning rushlight, a gas-light, and an electric light,—dim as is the glimmer of the first, and blinding as is the brilliance of the last—all owe their luminosity to the same principle, viz., to the incandescence of the tiny particles of carbon which are continually passing, and being rendered red, or white, hot in the course of their passage through the flame. Even so, in the case of the old flint and steel, a *spicula* of metal torn off from the mass, by the force of the collision, or "disruptive discharge," was suddenly raised to the temperature and luminosity of red-hot iron.

And this brings us by "easy gradients" to the improved modes of artificial lighting which are so peculiar a feature of the present age. What the convenience of the modern lucifer-match was in comparison with the old tedious knuckle-chipping process of obtaining a light by means of a tinder-box: such was the advantage of gas relatively to candles. But even candles themselves are, proportionately, a modern luxury—having been first used about the year 1300, previously to which date rushes or splinters of wood, soaked in fat, were the sole means of illumination among the poorer class in this country, whilst the rich lightened their darkness as a special luxury with pieces of string steeped in bees'-wax. Gas, however, as we have said, is an innovation within the last sixty years. So, too, the introduction of lucifers is a novelty. But the accommodation of being able to kindle a flame instantaneously, and at a cheap rate, is only a little younger than that of having one's light and one's fuel (for gas-stoves) laid on like the water to one's house; and not only the entire of this enormous town illuminated with an "air," the reservoir for which may be miles away, but the streets rendered as safe to travel by night, and the shops as showy as they are in the daytime.

The poetical pagans who allegorised the Sun as Apollo, the golden-haired god of poetry and music; as Adonis, the beautiful boy-god, the type of everlasting regeneration, youth, and grace; as Abaris, the undying and unflagging wanderer, who was for ever doomed to make the tour of the earth without getting either bite or sup; as the Ship perpetually sailing in quest of the Golden Fleece; as the Phœnix, the one bird of its kind that was eternally flying through the heavens, and rose continually from its own ashes—what pretty myths would not these pagan poets have created concerning this same wonderful Fire-air of modern times, which is not only a Night-Sun to us, but which, though as explosive as gunpowder, is carried in safety into the midst of our houses, and buried in miles upon miles of tubes under the pavement at our feet.

Some talk as to the cost of lighting the entire metropolis at present we shall reserve for another time.

* There are two artificial compounds notable for this property of shining in the dark, known respectively as "Canton's" and "Homburg's Phosphorus" (from the names of their discoverers); the former consisting of what chemists call the "protosulphide of calcium,"—*i.e.*, a simple combination of sulphur and the metallic basis of lime ("equivalent to equivalent"),—and the latter of "chloride of calcium." Moreover, sulphur, when rubbed in the dark on a heated brick, or other substance, which is not sufficiently hot to inflame it evolves an extremely weak blue flame accompanied with a peculiar odour. This flame, however, is not occasioned by combustion, but merely attends the evaporation or sublimation of the sulphur itself; for a cold body held above it becomes covered with "flowers of sulphur," thus showing that no oxidation has occurred; neither is there any sulphurous acid ($S O_2$) formed under such circumstances, and that must assuredly have ensued had such flames arisen from *combustion*.

PROFESSIONAL PAPERS ON INDIAN ENGINEERING.

Between the construction of bridges and other works that have no future, and architectural design that has no precedent, the doings of the engineering profession in India, the military branch especially, have frequently presented more occasion for criticism than for congratulation. The engineering college at Rourkee may be looked on as an important agent towards improvement, under its present management, and the papers on professional subjects of recent experience, published* under the editorship of Major Lang, the principal of the college, form an interesting and varied series of records of operations, some of them of rather an unusual kind, and affording instances of the reduction of theory to practice under conditions peculiar to districts only partially cleared and cultivated, and into which engineering operations are, to a great extent, being carried for the first time.

The professional papers issued from the Roorkee College Press are published in a quarterly octavo volume, averaging about 100 pages, with a considerable number of sufficiently carefully executed illustrative diagrams. We have before us the publications for August and November of last year, and February and April of the present year. The papers, in these numbers, include a considerable variety of subjects, from the manipulation of rivers and irrigating canals to the modification and improvement of working gear, both for the engineer and the labourer—the adjustment of levelling instruments, and the contrivance of a wheel-barrow fitted to the bodily capabilities of the "coolie," as distinguished from the "navvy."

The larger branch of subjects, to which we first referred, and which deal with what may be termed the manipulation of the face of the country in regard to the formation of means of communication, and the modification and control of its water-courses, necessarily occupies a considerable place in operations dealing with such great districts of comparatively uninhabited land. It is not too much to say that until a satisfactory basis is laid for a system of roads, and a definite experience gained of the changes to which the face of the country is subjected through natural causes, and the extent to which these can be controlled, the permanent inhabitation, and (consequently) the thorough civilization, of a district, are impossible. If we imagine such floods as have recently devastated some of our agricultural districts, as things possible and probable in those districts any year, with no certain indication of their extent or limits, instead of coming as the unusual result of a very abnormal state of weather, we may realise the condition in which some of the districts of India referred to in these engineering reports may be said to be, and the kind of task which is before the Indian engineer in endeavouring to acquire the information necessary for taking precautions against such invasions of nature, and to develop schemes for ultimately combating them. One of the first papers we come to is a short one by Mr. Burge, resident engineer of the Madras Railway, in which an attempt is made to find and express in a formula "a proportion between the maximum discharges through all bridges of and above 80 ft. aggregate span, on a section of the Madras Railway 110 miles long, and the terms representing the area and shape of the different basins they drain." Of course, as the author remarks, such a formula can never supersede the decision, guided by practical

* Professional Papers on Indian Engineering: Second Series, Nos. 13 to 16. Edited by Major A. M. Lang, R.E., Principal of the Thomason Engineering College, Roorkee. Printed and published at the Thomason College Press. Calcutta: Thacker, Spink, & Co. London: E. & F. N. Spon & Co.

experience, of an engineer inspecting the site and noting defined floodmarks, and the local traditions regarding exceptional freshes. We all remember George Stephenson's laconic remark in reply to the information of the friend who had driven him through part of the district for a new line of railway, and cautioned him against taking the then state of the streams as any indication of their volume of water in winter. "Pooh! didn't I see your bridges?" But where there are not friends or existing bridges to give information of this kind, the case is not so simple. The gist of Mr. Burge's formula, or rather of the reasoning on which it is based, is that all previous rules regard the discharge as proportional to some root of the drainage *area* alone; whereas he considers, judging from his own experience, that the shape as well as the area of the basin is an important factor in the result. "As an exaggerated instance, let a basin be supposed one mile wide and a hundred miles long; it will, with a free outfall, slope the same, and *cæteris paribus*, discharge *per second* a quantity not very dissimilar from that flowing from one of one mile square, though of course the larger area will take much longer to get rid of its flood." For the details of the application of the formula we must refer readers to the publication; it is sufficient to say the required factor of the shape of the basin is embodied with sufficient approximation for practical value in a formula in which the area of the basin in square miles is combined with the length of the main river in miles,—two data easily ascertainable, in most cases, from existing maps. The same volume contains a long and full account of the head works of the Agra Canal, by Major Helsham Jones, R.E., who was engaged on this part of the work. The canal is for navigable purposes, and "is a link in the chain by which it is intended hereafter to connect the Punjáb system of canals with that of the N.W. Provinces." The "Mooltan inundation canals," intended for agricultural purposes, form the subject of another paper by Mr. E. A. Sibold, which gives some information on the political economy, as well as the engineering connected with the subject. The difficulty in arranging the rates for irrigation, and proportioning them among proprietors in many separate villages, appears to have been considerable. "The share system, where a number are concerned, whether worked by the hour, by area irrigated, or by fractional shares in the stream of water, gives rise to too many disputes. Where irrigation is introduced into a new country, a carefulness in granting water-rights, though at the time apparently obstructive caution, will probably avoid future complication." At the same time, the introduction, through European engineering, of systematic irrigation into the poorer agricultural districts of India evidently has its bright side in its important economical and social results.

"The cultivators are, as a rule, hardy, energetic, and manly, and the canal officer who possesses tact and forbearance has little difficulty in earning their confidence and esteem. His canal improvements are so readily and warmly appreciated, that he can scarcely help feeling himself enthusiastic in his work, and he requires to exercise all his conservative feelings to restrain himself from altering too much at one time. Identified as he is so intimately with the agricultural prosperity and very life of the people, and brought into such frequent contact with them, the canal officer is the one to whom, in a failure of crops, the people naturally look for counsel, for assistance, and for relief. The Laugreals, near Mylsi on the Sutlej, once noted cattle-lifters, are now contented and industrious agriculturists. It is, however, a serious matter to develop irrigation in a rainless tract, where a collapse of irrigation works may cause an amount of suffering as disastrous as the Orissa famine."

To make irrigation successful, however, the person in charge must have authority to settle all disputes on the spot. Private (native) enterprise has only been successful, it is stated, in one case, that of a large landed proprietor; whose canals, the author says, will at his death be ruined by the Mahommedan laws of inheritance, which will give rise to litigation, pending the settlement of which the canal will collapse for want of maintenance. The people in general are so well aware of the drawbacks arising from such complications, that in one case of a proposed new irrigation canal of some extent, a number of landowners who would be concerned in its success, volunteered to subscribe and deposit in the Treasury the estimated amount required, on condition that it was made and arranged by the Irrigation Department. "They stipulated that during the first four years of its working, any outsider should have to pay a stipulated sum as compensation to the original promoters of the canal, but that after four years Government should have the right to manage it like the rest of its canals. They calculated on deriving so much benefit from it in this space of time, that it would be worth their while to hold out this inducement to Government to take it up. Tempting as the scheme was, the chances of litigation prevented them from undertaking it directly themselves." Such instances of the important bearing of English engineering and Governmental operation upon the well-being of the country districts of India, coming as they do in an incidental way in the midst of a directly practical paper, are certainly not without interest at present. The faith of the Indian agriculturist in Government seems indeed to be carried a little too far at times. It is hard to convince the people, on some occasions, that an apparent local or temporary loss is to be balanced by a general gain. "They see, in a way, the bearings of the case, but the people have a childlike faith in the idea that Government is willing to compensate with or without cause." The idea certainly has its counterpart among the opponents of public works, new railway routes, for instance, in this country.

Among the papers connected with similar subjects is an interesting account, by Mr. H. C. Graham, of the "Sutlej river-training works at Adamwahan," a report of the means employed to persuade the river to select permanently one of the various channels between which it oscillated, as well with the object of keeping a good and deep channel, as of bringing the current down in a normal direction upon the intended Sutlej railway-bridge, which would be endangered by its frequent changes of course and impact. The means employed were the formation of artificial "spurs" and weed beds in the side channels, in the hope of silting them up before the next floods. We may quote a portion of the description of this rather curious branch of operations.

"It was intended to adopt Colonel Brownlow's system as far as possible; to imitate the growth of weeds, to obstruct the channel without suddenly deflecting it, and thus to silt up the side channels. To effect this it was necessary to provide the weed itself, with means of anchoring it, and of keeping the upper end from sinking through being water-logged. This was done in the following manner:—The 'weed' consisted of a strong rope, or hawser, of moonj, generally 8 in. in girth, and of a length varying with the depth of water and strength of current up to 90 ft., with from two to ten bushes or small trees lashed to it by their butts, the largest bushes being placed lowest. The hawser was made fast to an anchor formed of a netting from 6 ft. to 2 ft. square, of 2 in. to 2½ in. moonj rope, with meshes from 4 in. to 6 in. square; in this loose bricks were built up as closely as possible, from 16 to 65 cubic feet being used in each net. To keep the weed from sinking when the hawser and bushes became water-logged, one or two empty casks were lashed to the upper end of the former. The casks, as a rule, remained perfectly tight, but as a precaution they were wetted daily, where it could be done without much expense.

Besides the above, fixed brushwood and net spurs were also used. The former were simply constructed of bushes and trees laid with their butts up stream, and kept in place by some of the anchors before described, to which they were made fast; as the bushes settled down, others were piled over them. The net spurs were made of netting similar to that above mentioned, in lengths of 100 ft. by from 6 ft. to 20 ft. wide, several being sometimes joined together. A hawser was passed through the lower meshes for the whole length of the net, and another through the upper ones; to the former anchors of the kind already described were made fast; to the latter, casks."

These means appear to have had very quickly the effect of cutting off the current from one of the obnoxious side channels, so far as to cause it to disappear in a space of about two months, from a process of natural silting up. The sections of the river bed at Adamwahan, from the 7th of August to the 12th of October last, given at intervals of a few days, show curiously the exceedingly treacherous and shifting character of the bed, and what the difficulty and risk must be in constructing a railway bridge which should form a secure passage over a river which was thus playing at hide-and-seek with the engineers all the time. From a note appended to the paper, by Lieut.-Col. Peile, R.E., Engineer-in-Chief to the Indus Valley Railway, it appears that the channel has been driven to as favourable a position as could be desired in the neighbourhood of the bridge site; and the result of the season's operations "affords good ground for hope that the oscillations of the river may be restrained with some degree of certainty within fixed limits;" but the whole account, with Mr. Graham's illustrations, affords a curious chapter on some of the difficulties of railway engineering in India. In the paper called "Notes on Bhangulpore," by Mr. Sibold, and in "Leaves from a Superintending Engineer's Note-book," by Lieut.-Col. Medley, R.E., we find the same source of difficulty dwelt upon; the former especially naming the Kosi river. "Marvellous tales are told of its treachery and violence. Its great floods are probably due to heavy rain in the outer ranges of the Himalayas, as all its floods are preceded by a change in the colour of the water, due to the washings of the low hills, which give warning of a flood at least a day before. Its deposits are not fertilising like those of the Ganges, owing to the much shorter time the silt is held in suspension. On the Kosi, the silt could not be carried more than a hundred miles; on the Ganges it is carried hundreds of miles. The constant changes in the river are due to the configuration of the country, and to the effects of the backwater of the Ganges in flood. A deep, well-defined channel and declivity are both wanting, to give a high velocity to the stream." Water, in short, seems to have a marvellous faculty of getting into the wrong place in India; of appearing where it is not wanted, and being scarce where it is. It is an item in Lieut.-Col. Peile's notes that "the water supply of many towns in the Northern Punjáb is in a very unsatisfactory state. For Peshâwur a scheme is now in progress for leading water from the Bara river, six miles off, through concrete ducts and iron pipes. In Rawal Pindee, the unhealthiness of the city is chiefly attributed to the unsatisfactory state of the water supply. The wells are 100 ft. deep, and often dry up just before the rains,—the people use the water of the Leh Nullah, which, as it is also used for bathing and clothes' washing, is fearfully polluted. A scheme is now under consideration for bringing in a supply from the Rawal Pool, nine miles distant." The prejudices of the natives often prevent them using means within their power for procuring water. In the notes on the Bhaugulpore district, just referred to, it is mentioned that "not a single appliance for raising water by animal power is to be seen in the district, the natives believing that bullocks are killed by walking in a circle."

The directly architectural work which, as our readers know pretty well, comes in India almost entirely under the control of the engineering profession, shows, as illustrated in the present number of the Roorkee publication, some definite attempt at consistency and purity of style. The most important work, in scale, is the proposed new chief court at Lahore (the present one being temporary only), of which we are told that,—

"The general plan was prepared in communication with the Judges, and has been approved by the Government. The style of architecture selected is the Gothic-Arabic [*sic*] of the fourteenth century, of which style Venice affords some of the most splendid and best known examples. It is believed that it is especially well fitted for India, the arcades giving the shade which is indispensable, while at the same time affording ample means for lighting and ventilating, being, moreover, highly ornamental. The great drawback to verandahs in general, at least in the remarkably dry heat of the Punjáb, is that they retain the heat long after the sun has gone down, and when the temperature of the surrounding atmosphere has cooled considerably, rendering it impossible to open any of the doors or windows of the main building which open into them. In the Gothic-Arabic style the open tracery work of the upper portion of the arcade affords ample means by which the heated air, accumulated during the day, can pass off, while the actual protection to the walls of the main buildings is almost as perfect as in the ordinary verandah; the arcades are, moreover, better lighted, and this is a great advantage, when it becomes necessary to light the rooms from the verandahs."

If it is really the fact that the verandah in its usual form shuts in and retains heat to the extent described, after the rest of the atmosphere has cooled, we can only say that the Anglo-Indian house-builders have been an uncommonly long time finding it out, and have gone on with a remarkable perseverance in building in a manner which it appears simple observation shows to be inconsistent with a part at least of the very result arrived at. The employment of the style named here seems a logical and sensible endeavour to combine architectural design with practical suitability for the purpose; and the general elevation of the new court for Lahore (the illustrations of which, by the way, are wretched specimens of architectural drawing and engraving) shows a sensible and purpose-like grouping of the blocks of building, and the plan is a good one; so far as one can judge from the inadequate illustrations, however, it would appear that the details of the "Gothic-Arabic style" will receive little mercy, and that ideas of proportion of parts, and delicacy of detail, have not been developed in the engineering mind of India much more at the present moment than formerly. A more successful architectural structure seems to be the design for the Maharaja's private railway station at Ulwar, which is in the Hindoo style, "the details taken from some of the best known and most admired types." It consists of a central room, with a dome over, and a waiting-room for the ladies and gentlemen of the Maharaja's suite

respectively, opening from this at each side; the dome is to be of brick, faced with marble, with a copper gilt pinnacle, and the sub-structure of the best description of sandstone; the interior finish to be plaster, with an enamelled surface to imitate polished marble (the vices of the West imported, we see, into Eastern architecture), and the floor of sandstone flagging, in an ornamental pattern, composed of pieces varying in colour so as to contrast with one another. It seems to be a tolerably successful revival of the Hindoo style in an appropriate situation. The design is the result of a competition, 500 rupees being offered for the best design; the one selected being by Teekaram, "the head draughtsman in the engineer-in-chief's office of the Rajpootana State Railway," on which the station was to be erected. That is really quite like an English competition. Another item of architectural news, which serves to show that some of our architectural shortcomings are at least not peculiar to Europeans, is found in a paragraph in the "Notes on Bhaugulpore," to the effect that, within the last few years, in that district, a number of temples have been built by the more wealthy natives, and that "some of the designs are very striking; but the effect is spoiled on closer examination, as the bricks are bad, and every ornament and projection is of plaster, like the icing of a Christmas cake. As these temples owe their construction to the desire of the wealthy to outdo each other, and not to a devotional feeling, there is no attempt to ensure permanence." It must be deeply touching to the English architectural wanderer in India to find the practice of his own dear native land thus vividly recalled to his recollection.

Among the papers which describe operations of a special kind, may be noticed one on the "Sleeper Slides in Jounsar Forest," by Mr. C. Bagshawe, assistant conservator of the forests. These were slides constructed to carry down an immense number of sleepers of deodar wood cut in the hill forest of Mundbol, and intended for the Rajpootana Railway. The carriage of these sleepers by hand was found to be impossible for want of the requisite number of men, and would have been a very slow business in any case. The plan ultimately adopted was a trough "slide," some miles in length, 12 in. wide inside, and fed with water at intervals from a stream near which it was carried, and thus to convey the sleepers down with no trouble but launching them at the top and taking them out at the bottom. The plan succeeded admirably, and saved much time and expense. One or two mechanical points in regard to it are worth quoting. The slide was at first 17 in. gauge inside, but it was found that the sleepers, from the play which they obtained from side to side, damaged both themselves and the trough, especially as the bottom of the latter was formed with two slabs, and the middle joint was opened by the battering of the descending sleepers against the alternate sides, while the sleepers were liable to jump out at the turns of the slide. The 12 in. gauge was then adopted, and rendered watertight by the simple expedient of hollowing each edge of the bottom slab about ½ in., and wedging it up tightly against the side slabs so as to compress the edges against the latter. It was found that the slide required to be fed with fresh water at intervals, as when the sleepers acquired considerable velocity in the lower part of their course they threw the water out of the slide. The trough itself was composed of pieces of the size and scantling of the sleepers, to be eventually taken up, when done with, beginning at the top, and the pieces shot down the remaining length, so that the whole would be eventually utilised as sleepers. One other contrivance illustrated in these papers, we may mention: a very ingenious boom-grating "for stopping floating logs near the head of the Ganges Canal," by Mr. T. S. Beresford, C.E. Much damage has been done to the works on the Ganges Canal by large logs, generally of heavy deodar wood, which come down with the current. More than once a boom was constructed to stop these, but gave way after a very short time, the difficulty being in getting anything strong enough to resist the impact of the logs, sometimes weighing eight or nine tons, without at the same time offering so much resistance to the current as to be weakened and carried away in a little while, or rendered liable to be broken through by a log of unusual size and weight. Mr. Beresford's remedy was the construction of a grating depending into the waterway, fixed in and hanging from a heavy beam above the water. "This beam has its ends fixed into toothed rockers of cast iron, carved to a radius of 2 ft., and these rest and roll in corresponding cast-iron segments, curved to a radius of 4 ft. The grating, which dips a foot or two into the water (depending on supply), is thus free to rock backwards and forwards, but in doing so the whole beam, grating, &c., is lifted through a certain height;" in other words, the action of the rockers is such that when the whole is at its natural centre of gravity, the grating points up stream at an angle of nearly 45°; but when a heavy log travelling down the stream strikes the grating, it forces it into an upright position, and in doing so rolls the rocker up in its seat to the extent of about a vertical foot, in which operation the whole momentum of the largest log likely to come down stream is exhausted, and the grating is strong enough to retain it after the shock of the first impact is thus broken. The diagrams, of course, give a better idea than mere description of this exceedingly ingenious yet simple contrivance.

The peculiar nature of the problems to be dealt with will render these reports of Indian engineering of some interest to all concerned in practical construction, and may offer suggestions for the treatment of problems of a kindred nature in other parts of the world.

SOME NOTES ON THE EARLY USE OF PORTLAND STONE AND OTHER BUILDING MATERIALS.

Limestones and other freestones have undoubtedly been used in this country since structures of stone were first built and lime first burned for building purposes; but at what particular date Portland stone and other cognate oolites were first brought to London for use in public works does not clearly appear. We are told in some of our standard books, historical and technical, in connexion with building matters, that previously to the early years of the seventeenth century Portland stone does not appear to have attracted any attention. Though we are inclined to agree with the statement that the use of Portland stone was not general in London till the time of Inigo Jones, still we have proof that it was used centuries earlier in conjunction with other limestones from France and the South of England. Casting about recently for some early mention of the use of Portland stone by name, we found in the City records "an inventory and valuation of stones belonging to the works at London Bridge, delivered to the wardens thereof by the outgoing wardens" (see Riley's "Memorials"), 24 Edward III., A.D. 1350, in which there is a distinct mention of squared and unsquared pieces of Portland stone, along with other building materials, the list of which, from their then odd names and value, will interest the building reader, and will not be out of place if reproduced. The old Bridge House Court and its adjuncts contained 400 great pieces of oak timber, value 40d. by the piece, making 100 marks; also a pile of timber lying in the garden close adjoining to the water of the Thames, valued at twenty marks. Also timber for fourteen shops, fully wrought and framed for immediate building, 36l. [This last item is very suggestive in these days of shop architecture and wood-working machinery.] Also, divers pieces of timber lying in various places in the said court, valued at 19l. 6s. 8d.; also 120 pieces of elm for piles, at 2s. the piece, 12l.; also, in the Grange, 125 rakes [used for catching the refuse on the Moor Fleete, Walbrook, and other streams], at 5d. each, 52s. 1d.; also divers boards of oak and of "estrichesborde," value 6l. 12s. 4d.; also, 57,000 "herth-lathes," value 4s. per thousand, 11l. 8s.; also 30,000 sap-lathes, value 2s. per thousand, 3l. The total of the items before mentioned being 169l. 19s. 1d. The term "estrichesborde" was probably applied to deal boards from the Baltic or the Eastern countries. The "herth-lathes" were the superior laths made from the centre or heart of the timber, and the sap-laths were those inferior ones with the sap in the wood. The inventory continues: "Also 690 ft. of stone of Porteland, hand-worked and squared, as also 1044 ft. of stone of Porteland, not wrought, the total being 1,734, value 5d. per piece, 36l. 3s. 11d. [a mistake, 36l. 2s. 6d.]; also 600 of coynston [quoin or corner stone], value 5s. per hundred, 40s. [30s.]; also eighteen great stones of Bere [suggested with a good show of reason as being Bere Regis, in Dorset], weighing eighteen tons, value 6s. 8d. per ton, 6l.; also a heap of mixed mortar, value 4l. 8s.; also 12,000 tiles, value 8s. per thousand, 4l. 16s.; also cement for the bridge, 3l.; also seven barrels of pitch, value 4s. per barrel, 28s.; also two boats of ragstone value 23s.; also a boatload of chalk value 7s. 6d. The total of stone and other items being 59l. 6s. 5d." To summarise the other items we find 7½ weys of old lead, valued at 6s. 8d. per wey; 12,000 "plaunchees-nails" (plank-nails or spikes), valued at 4s. per 1,000; 3,000 "dornails" (door-nails), at 2s. 6d. per 1,000; 400 large nails for the drawbridge at 12d. per 100. Further on we have mention of "wyndou-nails" (window-nails), valued at 2s. 6d. per 1,000; a stock of "travers-nails" (tree-nails), at 8d. per 1,000; "grapes" of iron (prongs or grappling-irons), at 1d. each. The total value of the building materials in the Old Bridge House, which were all enumerated, was estimated at 250l. 18s. 2d.,—a large sum when considered in view of its purchasing power in those days, either in the way of materials or labour. Among the articles not valued, were one great boat, a small boat, a "shoute" or "schuyt" (a timber barge, perhaps), two engines, with three "rammes" for ramming piles, two cauldrons for melting pitch for cement, one presser for fixing, five pots of brass, and four posnets, old and worn out. We consider this inventory of building materials a very interesting one. Long before the above-mentioned period, in 1329, we find in the City records proceedings were taken against Hugh de Hecham, a lime-burner, for extortion and intimidation. The petition that was presented or delivered to the mayor of the city, John de Grantham, is rather long for quotation here, but it commences to the following effect:—"Show unto you the good folks of the Ward of Tower as to the great grievances which Hugh de Hecham, lymbrennere, has committed, in that he caused all those who are of his trade to make oath, that whereas people used heretofore to have one sack of lime for one penny, or at the rate of 3s. 6d. per hundred, at the time when sea coal [sea-borne coal] was selling at 40d. the quarter, now one is not to have of the said Hugh any sack of lime for less than 1½d. or 2d., or else at the rate of 6s. or 5s. the hundred; seeing that the present value of sea-coal for this year is no more than 16d." [by the quarter]. It appears that the redoubtable Hugh succeeded by menaces to prevent the workers of lime of Greenhithe who used to bring lime from that place to London to sell, from coming thither, but those who did come to London with lime, as a forestaller he embraced or made friends with these people, and thereby secured the trade for himself at his own terms. Hugh, however, after due investigation, was found guilty of the charge imputed against him, and it was awarded that he should lose his freedom and go to prison.

In the 30 Edward I., 1302, there is an agreement to indemnify the City against fire, and to roof houses with tiles. One Thomas Bat, before John le Bland, the mayor, and certain aldermen, bound himself, and all his rents, lands, and tenements, to keep the City of London indemnified from peril of fire, and other losses which might arise from his houses covered with thatch in the parish of St. Lawrence, Candelwykstrete, and he agreed that he would have the said houses covered with tiles by a certain stated time. If he failed, the Mayor, sheriffs, or bailiffs of London were to cause the said houses to be roofed with tiles out of the issues of the rents. In the fourth year of the same reign, 1272, we find that playing with tiles was a sort of pastime. From the fatal accident that gave rise to the entry it would appear that the throwing of the tile was a species of a game of quoits, tiles probably rounded for the purpose.

In the account rendered by William Sunnyngge, a carpenter, as to moneys expended by him as trustee on the repairs of a house in the parish of St. Michael, Cornhulle (Cornhill, London) 33 Edward III., 1359, we have a number of very interesting items as to the cost of some building materials and workmen's labour. From this curious document we find that a tiler for two days' wages received 14d., or 7d. per day; his man for the same time, 10d.; for their drink (beer money we suppose), 2d. The cost of 500 tiles was 4s.; a cartload of sand, 4d.; 6 sacks of lime, 12d.; 2 small wedges, the same; 2 slates for a gutter, 2s.; 4 cartloads of stone for the pavement, 10s.; 24 cartloads of gravel, 8s.; paviours' work, 6s.; timber and *ponchouns* (puncheons, or posts driven between the small timbers like stays inclining inwards) to mend the walls, 3s.; for 1,500 lathes (laths), 2s. 3½d.; for 1,500 trasson nails (treenails), 18d.; for 1,500 sprigges (brads, or nails without heads), 15d.;

other nails, 4d. A carpenter's wages for 2 days are put down at 14d.; 12 cartloads of *lom* (loam), 4s.; 9 sacks of lime, 18d.; 3 cartloads of sand, 12d.; for one workman's wages for daubing [daubers were layers on of a mixture of straw and mud to a framework, or betimes the layers on of a better compost approaching modern plaster], 9 days at 7d. per day; the dauber's man received 5d. per day. Farther on, in the same account, we find a carpenter's wages charged at 8½d. per day. This was 1½d. per day more; so it would appear that in these early times there was a classification, and no uniformity for bad and good workmen. For soldering a gutter, 12d. is charged; candles used for doing it, 1d. A tiler and his man for one day received 13½d. The next is an entry of some interest: for heightening a room of the said tenement, and for two engines hired for the same for 2½ days, 2s. Now what were the two engines? Were they a species of screw-jack, or some early shoring apparatus for lifting and "needling." Three men were paid for setting piles and for ramming (*rammag*) the same, 2s. Again, we find a carpenter, for 2½ days, 20d.; two carpenters, for 2½ days, at 7½d. per day, 3s. 1½d.; for their drink the same time, 2d.; and for six piles and four bases, 5s. In the foregoing items we find three distinct rates of wages for the carpenters of 1359,—viz., 7d., 7½d., and 8½d. per day. Possibly, the account, though rendered in the above year, extended back over a considerable time.

Reverting to the subject of Portland stone. In these early days its use, of course, must have been limited in London. Taking into consideration the history of Portland Island and the connexion with the church of Winchester, for some time before the reign of Edward the Confessor the island or promontory belonged to that church, we might deduce reasons for believing that Portland, as well as Caen, in Normandy, was resorted to for a supply of building limestone. We believe there is scarcely any mention of Portland Island in our annals before the time of Ingulphus, who lived in the reign of Edward the Confessor, and was chaplain to William the Conqueror. He tells us it was used as a landing-place by the Danes, whence they sallied out against the defenceless inhabitants. In the reign of Edward I., Portland Island was purchased by Gilbert de Clare, Earl of Gloucester, but it has been for a long time back the property of the Crown. The quarries now on the island are either worked by the Government, or leased to private parties, who pay a royalty of 1s. on every ton of stone raised, half of which goes to a trust fund for the islanders. This was a slight compensation for the destruction of the pasture land, and was granted in the time of Charles II., in whose reign the quarries first, to any large extent, were worked, and principally for London building purposes. The qualities of Portland and Bath oolite were, doubtless, well known by that great prelate and builder William of Wykeham, both in his character of Surveyor of Royal Buildings for Edward III., and as a great church builder at Oxford, Winchester, and elsewhere. The introduction of Caen stone into England probably dates from the time of the Norman Conquest, for it appears to have been the favourite material with the architects or workmen who followed the fortunes of William Duke of Normandy and his successors for some time. Its introduction into Ireland is believed to be somewhat earlier, contemporary with the introduction of the Norman and Lombardian styles into the sister kingdom. According to Mr. G. Wilkinson's "Ancient Architecture and Practical Geology of Ireland," limestone has been employed in most of the ancient structures in Ireland, the doorways of round towers and churches showing excellent examples of Norman mouldings and other work belonging to a period anterior to the introduction of that style into England. Sandstone, however, appears to have been a favourite material for sculptured work and ecclesiastical or monastic buildings previously to the introduction of the Early English style, after which time limestone was more often employed. The oolite limestone used in the interior of Christ Church Cathedral, Dublin, presents the appearance of Bath stone; but Caen stone has a very great resemblance to Bath and Cheltenham stone. The cream-coloured oolitic or jurassic limestone in the old interior work of Christ Church Cathedral was either imported from Normandy or this country, for it is not uncommon to meet with the oolitic stone in structures of the eleventh or twelfth centuries in Ireland. Christ Church was founded about the year 1038, and a great portion of the old structure, at least, was built in the Anglo-Norman style. It has been said that the cream-coloured oolitic limestone in the old work of this ecclesiastical edifice is identical with that of the West of England. Among the limestones of Ireland there is but little of the oolitic kind. Mr. Wilkinson gives some instances of the occurrences of the latter variety along the shores of Killala Bay, in the West of Ireland, and this oolitic variety has been used in the construction of the ruined Abbey of Moyne, beautiful still, though in ruin. The sharpness of the sculpture and ornamentation is still retained in the oolitic limestone of this ancient structure.

Portland and Bathoolite, we contend, have been used in these countries for centuries back, and though supplanted after the Conquest by "tender Caen stone . . . more beautiful than durable," to use the words of Sir Christopher Wren, yet through the taste, influence, and energy of Inigo Jones, and the architect of St. Paul's, the use of native limestones, [Portland, Bath, and other cognate kinds, for ecclesiastical or civil building purposes, was revived. The former architect repaired a portion of old St. Paul's, casing the exterior and adding a Corinthian portico to the lowest part in Portland stone. St. Paul's Cathedral, and most of the churches built in the reign of Queen Anne, are built of Portland stone, but it is a fact that the stone so much used by Sir Christopher Wren, was superior to the description now used. The quarries that supplied the stone for St. Paul's Cathedral and other buildings erected by the great architect, are not now worked. "It does not pay" modern builders to work or to pay for the working of such hard oolite. Old Westminster and Blackfriars bridges were built with Portland stone, and Thomas Cooley, the assistant of Robert Mylne, the architect of Blackfriars-bridge, used Portland stone in his first great public work, the Royal Exchange of Dublin, for which he competed, and won the first prize, in 1769. James Gandon, his contemporary, or successor, in Dublin, used it in the Custom-house, his additions to the Irish Houses of Parliament, and other public works. Long previously to this, it was used by Sir Edward Lovet Pierce, in the columns and portico of the main building of the Parliament House in Dublin, commenced in 1729. Portland stone is also used in the frontage of some of the buildings of Trinity College, and other later buildings in Dublin. We believe that the columns of the old City Tholsel, in Dublin, built in 1683, were of Portland stone, and, if we are not mistaken, the same stone was used to some extent in the ornamental work of the Royal Hospital, Kilmainham, built about the same period. There appears to have been an interchange of trade in stone between England and Ireland for a considerable period, and of other building materials also. Irish oak was an old importation, and in return for English oolites some carboniferous limestones, including black marble, flagstones, and even burned lime were exported from Ireland to Holland and this country. From the limestone group of Ireland, which consists of three divisions,—the lower, the middle, or "calp" (the common building stone of Dublin), and the upper limestone,—a great variety of building stone is obtained. The calp is liable to rapid decay, but it yields in some localities a valuable hydraulic lime. The lower or upper division, according to Professor Hull, the director of the Geological Survey of Ireland, produces a good crystalline greyish limestone, sometimes dolomitic, and in a few instances oolitic. The carboniferous limestones of Ireland contrast unfavourably as regards colour with those of England, but as a source for the production of marbles it is valuable in an architectural point of view. The steps that formerly ascended to the entrance to St. Paul's were said to be from the limestone quarries of Red-Cow, near Dublin. The black marble or flagging used in connexion with Bird's statue of Queen Anne, opposite St. Paul's, is stated, according to the specification or particulars of that work, to be from Ireland. Ireland still imports a quantity of building limestone, Portland, Bath, or other kinds from England; and the trade in Irish marbles, grey, black, and variegated, is increasing yearly for building and ornamental purposes. Irish granites, Donegal and Dublin, and other coloured varieties, are contesting the field with the Aberdeen kinds. This interchange of trade is also, as in the early days of the introduction of Caen stone, leading to an interchange of workmen. The London limestone stone-carver or mason makes but poor progress in the working of Dalkey, Aberdeen, or Jersey granite, and the artist or artificer that is constantly manipulating the harder material is not fitted to render the delicate touches with chisel and mallet that working in the softer or freer limestone requires, particularly in undercut moulded and elaborate tracery and foliation. With workmen of this class, when for long periods they are engaged on the same material, mind and hand become attuned, so to speak, and there is a conscious *weight* of feeling in each blow they give. Any sudden transition from hard to soft material, from the hardy granite, "the noblest of all the rocks," to the tender Caen or cognate oolites, will not tell favourably for the temper of the workman or his tools, the satisfaction of the employer, or the satisfactory execution and finish of the work. The art of building is an old art, and its history is the history of its architects and workmen, but what should have been learned first of it, as its basis, the geology and structure of our building stones, is being learned the last, to the great injury of architecture as an art.

BRITISH ARCHÆOLOGICAL ASSOCIATION AT EVESHAM.

The Corporation of the quaint old town, Evesham, received, on Monday last, the members of the British Archæological Association with an address, in which they said,—"The Vale of Evesham has long been famed for its fertility and for the beauty of its scenery, and from very early days it has been a busy centre of life. The earthworks and ancient camps of the hills which enclose the vale testify by their number and size to its importance in the eyes of the ancient Britons; the Roman occupation is to be traced on every side by the ruins of the buildings, the names of places, and the large number of coins found scattered over the country; and in the Middle Ages the famous Abbey of Evesham was one of the principal centres of religious life in England. Few neighbourhoods afford the opportunity of a visit to so many sites of abbeys and other spots connected with historical events of great and abiding interest. Our own abbey church has unfortunately disappeared, the little that remains of it, after having been used as a stone quarry for one hundred years, lying buried beneath the ground; but our town still contains many relics of the buildings connected with the Abbey, and these and the site of the battle of Evesham will be visited with interest, as will also the spot where lies the body, though now unmarked by any memorial, of Simon de Montfort, the founder of the House of Commons. If the accommodation which our town affords to visitors is small, we feel that the attractions which it presents to the members of such a society as the British Archæological Association are great indeed, and it will be our endeavour to afford you every facility that lies within our power to make your visit here both agreeable and profitable."

The Marquis of Hertford, as president of the Association, then delivered an excellent inaugural address, in the course of which he said,—"You, perhaps, think I bear too close a resemblance to one of my ancestors and predecessors at Ragley, the first Viscount Conway, who was Principal Secretary to James I., and of whom, in consequence of his not having the gift of a ready pen, the King complained 'that "Steenie" had given him three notable servants—a Gentleman of the Bedchamber, Clark, who could not untruss a point, he had but one hand; a chaplain, Dr. Preston, who could not say prayers, for he scrupled the use of the Liturgy; and a Secretary of State, Conway, who could neither read nor write, having been bred a soldier.' I also have been bred a soldier, and you are now suffering from my education, or rather from the want of it. We are standing on the confines of Worcestershire, Gloucestershire, and Warwickshire, in the picturesque town of Evesham, which has been so well chosen for our meeting, not only for its own intrinsic merits in the eyes of antiquaries, but from its neighbourhood to so many objects of real interest. To-day we shall visit the Abbey, the old churches, and other antiquities, and shall hope to see the grounds and museum of Mr. Rudge, so rich in reminiscences of the famous battle of Evesham of 1255, a subject on which I will not dilate, seeing that we are promised a paper on that historical subject by Mr Herbert New. During this week we hope to visit Broadway, Buckland, Stanway, Hailes Abbey, Winchcomb, Sudeley Castle (where my

ancestor Lord Thomas Seymour, the brother of the Protector Somerset, lived), Wyre, Pershore Abbey, Deerhurst Saxon Church, and thence to Tewkesbury Abbey, several of which interesting places are, as you know, in Gloucestershire." After expressing a hope that the buildings and records of the neighbourhood might derive fresh illustration and additional interest through the visit, the Marquis added, "but knowing we have so many first-rate archæologists like Mr. Evelyn Shirley, of Ettington; Mr. Matthew Bloxam, of R gby; the Rev. Mr. Brodie; the Rev. A. H. W. Ingram; Mr. Tom Burgess, of Leamington; the Rev. F. Kittermaster; the Rev. Leigh Colvile; &c., and have likewise whole societies devoted to antiquarian research, like the Warwickshire and the Malvern Field Club, and the Warwickshire Natural History and Archæological Society (whose excellent museum and library may be visited at Warwick), I fear that the ground has been too often gone over to afford much novelty during the present visit. The Society which I have the honour of addressing was established in 1843, and bears the name of the original society, from which the Archæological Institute sprang. Perhaps England is rich enough and broad enough to maintain two bodies similarly engaged in the useful pursuit of antiquarian knowledge, but I hope you will forgive me expressing a hope that those who know more about it than I do will, before long, see their way to reuniting the two societies, and so make each more practically and beneficially useful.

Lord Hampton, in an appropriate speech, proposed a vote of thanks to the Marquis for his address. He added that he rejoiced to see the noble residences in this noble land occupied by those of ample means and ability. There was a time when Ragley was only a name; now it was a reality. The Association had done well in choosing Evesham for its place of meeting, and they could not have done more wisely than in selecting the noble marquis to preside over them, and he was glad that he had thought it is duty to accept it.

Mr. George Godwin, in seconding the motion, said the Association were not at all distressed to hear of the number of similar societies now at work, because they recognised in these societies their own offspring. He alluded to the necessity which existed for Sir John Lubbock's Bill, and urged that all local societies should petition in its favour. He also made an appeal in favour of the preservation of Cæsar's camp, at Wimbledon.

The party proceeded to the battle-field in Abbey Manor grounds, which had been thrown open by Mr. Rudge. An obelisk has been erected, bearing an inscription recording how the battle was fought on the 24th of August, 1255, some bas reliefs, and the following lines from Drayton:—

"Great Lester here expired with Henry his brave sonne,
When many a high exploit they in that day had done,
Scarce was there noble house of which those times could tell
But that some one thereof on this or that soil fell.
Amongst the slaughter'd men that there lay heap'd on pyles,
Bohuns and Beachamps, were Basets and Mandevilles,
Hartreshull, Crepping, Despenser, Baliol, Rowele,
Inde, Tregoz, Ernefyeld York, Bermingham, Trossell,
Segrave. And Saint Johns seeks upon the end of all
To give those of these manes their Christian buriall,
Ten thousand on both sides were laid and slain that day,
Prince Edward gets the gole, and bears the palm away."

Here Mr. New gave a brief account of the incidents of the battle.

In the grounds of Mr. Rudge were found scattered many remains of the abbey,—the bases of columns, ugly gurgoyles, parts of niches, tracery of windows, old coffins. The abbot's chair, and two carved figures, from the Bell Tower, stand in the porch of the mansion. The Earl's Well was found to be in a very neglected state.

At a dinner in the evening, given in the Town-hall, the Marquis presided, and various speeches were delivered by the chairman, Lord Hampton, Sir E. Lechmere, Mr. Brock, Mr. Geo. Wright, Mr. Godwin, the Vicar of Evesham (the Rev. J. W. Holland), and others.

Mr. Holland expressed a hope that a monument to Simon de Montfort might one day be erected on the spot where he died, and a subscription to begin the movement was at once offered by a member of the Association.

On the following day, Stratford-on-Avon was visited, and a most enjoyable day spent; papers being read in the evening. Mr. Halliwell-Phillipps, F.R.S., Mr. Thos. Blashill; the Rev. Canon Ingram, Mr. Edward Roberts, F.S.A., Dr. French, the Rev. Dr. Collis, and others assisted in the work, but we reserve particulars for next week. The hotel accommodation at Evesham proved to be limited, but this was supplemented most kindly by a number of the inhabitants. And it deserves mention that the Duke d'Aumale, who has a residence close to the town, placed it at the disposal of the Council, ten bedrooms being prepared in it for their use.

OPENING OF THE FIRTH PARK, SHEFFIELD.

The visit of the Prince and Princess of Wales to Sheffield has been a memorable event, and served to give its teeming population an opportunity of showing that in all that goes to make up good and loyal citizens, they are quite equal to the people in any other town in the kingdom. When Mr. Mark Firth was elected Mayor of the borough, and on a subsequent occasion purchased the Page Hall estate, he announced his intention of presenting a portion of it to the town, and of asking their Royal Highnesses to do him and the town the honour of coming down to open it; and when it was known that the invitation had been graciously accepted and the day fixed for the ceremony, even the most sanguine could not have hoped that the men of Sheffield would, at the sacrifice of so much money and time and labour, produce such a display. The decorations were carried out with commendable spirit. We may mention those of the Lady's Bridge and the Shambles, the cost of which was borne by the Duke of Norfolk. The designs were prepared by Messrs. Hadfield & Son, architects, and the carrying of them out was entrusted to Messrs. Tyler & Co., of Manchester. On the site near Lady's Bridge stood the old Sheffield Castle, and it was attempted to reproduce the massive frowning gateway, with its arches and its towers; its inner walls rising height beyond height, and other surroundings of the ancient site. The chief feature in the design was a three-span arch, stretching from the hotel to the shambles wall, and which represented an old baronial gateway or city bar. The height to the battlements was 60 ft., and to the top of the flagstaff over 100 ft. The centre arch had a span of 20 ft., and each of the side arches was 11 ft. wide. The centre arch was 25 in. high inside; the depth of the arch 27 ft. Springing from the square of the arch were four round castellated towers, 40 ft. high, and 10 ft. diameter, terminating with spiral roof, and surmounted by gilded vanes. In the centre of the four round towers was a square tower, with roof, painted to represent old-fashioned red tiles. Over the centre of the archway, on each front, were placed the arms of the Duke of Norfolk; and on each side of the arch six shields, correctly displaying the arms of De Busli, De Lovetot, Furnival, Nevil, Talbot, and Howard. The structure was strongly built of wood, covered with canvas, and painted to represent stonework. At a distance of 54 ft. from the arch, in the direction of the Shambles, was another tower, rising to a height of 40 ft. above the elevation of the permanent wall. The permanent castellated wall of the Shambles had been cleaned, and on the roof of the Shambles had been erected a platform 5 ft. wide and 300 ft. long. At the back canvas walls had been raised to a height of 50 ft., in two lengths, to represent the interior walls of an old castle. The inner wall had been continued 294 ft., and terminated with another tower of a castellated form, 25 ft. square and 90 ft. high. It had a massive and solid-looking appearance, and formed an appropriate termination to that line of the decorations.

After the arrival of the procession in the park, and the reading of the addresses, the mayor handed to his Royal Highness the deed of gift, by which he dedicates the Firth Park for ever to the public use and enjoyment of the inhabitants of the town. The Prince presented the deed to the town clerk on behalf of the corporation, and formally declared the park to be open. The deed of gift provides "that no political meeting shall be permitted to be held, and no intoxicating liquor shall be permitted to be sold, in the said park, or any buildings or erections thereon, at any time, and no game or music shall be permitted to be played therein on any Sunday or Good Friday."

Fire Brigade Station, Commercial-road. The contractors by whom this building, illustrated in our last, was erected, are Messrs. Stimpson & Co.

EAST GRINSTEAD.

The Rural Sanitary Authority for East Grinstead some short time back advertised for schemes to be submitted to them by engineers for the sewerage of the town, and for the disposal of the sewage, on the understanding that the author of the scheme chosen should be employed to carry out the works.

Schemes from sixteen engineers were sent in for the consideration of the Sanitary Committee, who have decided to recommend the Board to adopt one submitted by Messrs. Smith & Austin, of Hertford. The accepted scheme proposes to sewer the town with small earthenware pipes upon the "separate" system, and to dispose of the sewage by irrigation upon land rather more than a mile from the town.

NEW WORKHOUSE AT SHIELDS.

The Guardians of the South Shields Union have resolved upon the erection of a large new workhouse in consequence of the existing structure being inadequate for the purposes of the union. At the meeting of the members of the Board last week the committee reported that the Ecclesiastical Commissioners had offered a site, ten acres in extent, for 2,200*l.*, which the committee recommended the guardians to accept, and also to authorise them to invite architects to send in plans and designs for a new workhouse to contain 700 inmates, offering for the first selected design 100*l.*, and for the second 50*l.* The recommendation was confirmed, and Mr. J. H. Merton, architect, of South Shields, was instructed to prepare the necessary specifications for the guidance of the competitors. The estimated cost of the building is from 28,000*l.* to 30,000*l.*

INCOME AND EXPENDITURE OF THE CORPORATION OF LONDON.

An account of the produce and expenditure of the City's estates for the year ending the 31st of December, 1874, has been published, under the authority of the City Chamberlain. The document is one of a voluminous nature. The City's receipts are enumerated under various heads, and details are given in every case. Among the receipts are rents and quit rents, 93,510*l.* 17s. 7d.; renewing fines, 3,438*l.* 13s. 5d.; premiums for granting leases, 1,200*l.*; Metropolitan Cattle Market, Islington, 37,351*l.* 12s. 11½d.; Metropolitan Meat and Poultry Market, Smithfield (exclusive of tolls), 40,455*l.* 13s. 11d.; the total receipts being 313,917*l.* 7s. 9d. On the same side of the account is given a statement of loans raised, amounting to 263,872*l.* 4s. 6d., so that the grand total was 577,789*l.* 12s. 3½d. Among the charges for expenditure are,—the expenses of the Civil Government of the City, amounting to 49,304*l.* 7s. 4d.; expenses in relation to Epping Forest, 12,260*l.* 19s. 6d.; Guildhall Library and Museum, 2,810*l.* 16s. 3d.; erection of the new library and museum, 6,570*l.* 19*s.* 3d.; the total being 274,238*l.* 0s. 3d.; but, in addition, under the head of loans discharged, are charges relating to the enlargement of Billingsgate Market, 60,034*l.* 10s. 11d.; western extension of Metropolitan Meat Market, 47,755*l.* 17s. 8d., bringing the total expenditure to 554,044*l.* 3s. 5d.

Disposal of Refuse on Building Sites, Liverpool.—Alderman Bennett, in reply to the report published by the Health Committee under the above title, reiterates his assertions:—He adds, "I wish to say that every statement contained in my two letters to the Local Government Board is strictly correct, the space of land covered, the varying depths of deposits, the description of the ashpit offal, and the class of streets from which sweepings have been extensively used, spontaneous combustion, the number of persons not in the corporation employ earning a livelihood by picking out a portion of the organic matter, and that the Health Committee, owing to frequent complaints, did discontinue carting for a length of time. I will add, the straw taken out of beds when fever in the town was rife, are all matters so easily proved that the Health Committee, in my opinion, would have acted more wisely in admitting all to be true, and defended their course of action, if they could, upon its advantages and merits, if it has any."

AN ARCHITECTURAL NOTICE OF ST. SEPULCHRE'S CHURCH, LONDON, AND OF ITS RESTORATION.

The parochial church is dedicated in commemoration of our Saviour's sepulchre at Jerusalem. It was founded in 1100.

Roger, Bishop of Salisbury, in the reign of Henry I., gave the patronage to the priory of St. Bartholomew, in West Smithfield, who established a perpetual vicarage, until the dissolution of monasteries by Henry VIII., when it fell to the Crown until 1610. James I., in the seventh year of his reign, granted the rectory and its appurtenances and advowson to Francis Philips and others. After which, the parishioners purchased the rectory, and held it in fee-farm of the Crown; and the advowson was purchased by the president and fellows of St. John Baptist's College, Oxford, who are still the patrons. In 1636, this impropriation, held in fee-farm, was worth 440*l.*; and the vicarage, endowed with a third part of the tithes, &c., was worth 179*l.* 14s. 6d. At present, the vicar receives 200*l.* per annum, in lieu of tithes, as settled by Act of Parliament.

This church, says Stow, was re-edified or built about the reign of Henry VI., or of Edward IV. One of the Popbams was a great builder there, namely, of one fair chapel on the south side of the choir, as appeareth by his arms and other monuments in the glass windows thereof, and also the fair porch of the same church towards the south; his image fair graven on stone, was fixed over the said porch, but defaced and beaten down; his title by offices was this,—Chancellor of Normandy, Captain of Vernoyle, Pearch, Susan, and Bayou, and treasurer of the king's household. He died rich, leaving great treasure of strange coins. Sir John Popham was buried in the Charterhouse Monastery, and his monument was placed in the cloister.

The church erected in 1450, consisted of an embattled tower with four octagonal embattled turrets surmounted by octagonal crocketed pinnacles, angular buttresses, &c. Nave, with north and south aisles; chancel, with north and south aisles, separated by screens. Chapel on the north side of the north aisle. Porch, with parvise, and a room over; winding staircase enclosed in a turret. The staircase to the upper room was enclosed by a door on the parvise landing, as well as doors to the rooms. Fireplaces, one in each room. Windows on the south and east sides only. The porch-windows pointed, in three cinquefoil-headed lights with Perpendicular tracery. A niche over the outer doorway containing a stone statue of Sir John Popham. The roof was a low span, with diagonal and angular buttresses, with pinnacles and embattled parapets. The porch was groined with fan tracery, with 17 bosses, at the intersections, consisting of angels supporting shields; one of them has a saltire, one has a crescent and a dagger; on another shield is a fleur-de-lys; on another a wreath of foliage, enclosing a shield, on which is a fess and a bird. On others are foliage, knots, and various devices. There are two small niches inside the porch, over the outer and inner doorway, with kneeling figures. The former contains a male figure with flowing beard, supported by a bird with wings expanded; the latter has a female figure holding a book, and under this niche is an oval shield, with a cross and dagger sculptured thereon, in resemblance of the city arms. On the outside over the doorway was a black marble slab, 4 ft. 3 in. long, by 2 ft. 6 in. wide, and 3½ in. thick. There was formerly an inscription upon it.

The nave and chancel were separated from the aisles by clustered columns with moulded capitals and bases, supporting pointed arches, and surmounted by an open-timbered roof. The windows of aisles and chapels were large and well proportioned, being 17 ft. by 9 ft. 3 in., in three cinquefoil-headed lights, with Perpendicular foiled tracery over. The chancel and aisles comprised three bays or compartments at the east end, separated from the nave and aisles by screens. The east wall has been rebuilt in a slanting direction, depriving the south elevation of one window. The aisles were embattled the same as the porch.

The font, designed by Wren, now stands at the west end of St. Stephen's Chapel; it is octagonal, of Portland stone, and large enough for total immersion, with water-drain stopped up. The font consists of a bowl and stem, moulded; the bowl is curved and convex fluted in the Roman Doric style. The lid is of oak, of an octagonal inverted ogee form, the ornaments on the top and angles being gilt. Spread on the eight sides of the base of the lid is the following inscription in gilt letters:—

"The Native of this Parish,
Gave this Type and Font
In the year: 1670:
The Steward then being
Joh. Clear, Joh. Stringer,
Thea. Barwick, Joh. Dyer,
Josi. Priest, Geo. Reade,
Joh. Blincoe, Rich. Johnson."

At the east end of the chancel, in the floor, is a blue monumental stone to the memory of Captain John Smith, Governor of Virginia, who died June 21st, 1631; his romantic and chivalrous adventures are recorded by Stow in an epitaph, now gone. In the wars of Hungary, in 1602, he in three single combats overcame three Turks, and cut off their heads. For this, and other brave deeds, Sigismund, Duke of Transylvania, allowed him to bear three Turks' heads as his shield of arms. Upon the above monumental stone is sculptured a large shield with three heads.

Stow gives four other monumental inscriptions, which, with Captain Smith's, are inserted in "Maitland's History of London." Stow also says that William Andrew, Stephen Clamparde, Lawrence Warcam, John Dagworth, William Porter, and Robert Scarlet, lie buried in this church.

In the various drawings and views of London before and after the Great Fire, the church of St. Sepulchre can be discerned. In the Sutherland collection, Bodleian Library, Oxford, is a drawing of London in 1543, by Anthony Deu Wyngrerde. A view, drawn by R. West, in 1737, of the south front, was published in 1739.

The church was much damaged by the Fire of London in 1666. The tower, south porch, St. Stephen's Chapel on the north side, and the walls were capable of reparation.

In 1670, a general reparation was made, as asserted, under the direction of Sir C. Wren, but not with his usual good taste.

In 1790, sixty-seven years after the death of Wren, the church was in a great state of decay; in this year the walls of the church were cased with Portland stone, and all the windows were taken out and replaced by others, with plain semicircular heads. The battlements were taken down, and a plain stone parapet substituted. The roof at this time was wagon-headed. The angle piers of the tower being weak, they were strengthened by inserting within the five pointed arches semicircular arches and Bath stone Tuscan columns.

In about 1837 an entirely new roof was erected; these alterations are detailed in Godwin's "Churches of London." The model of the new roof is in the roof of the present body of the church.

In 1859 the large east window was filled with stained glass by Messrs. Lavers & Barraud, at a cost of between 300*l.* and 400*l.*

The churchyard next the Holborn Viaduct was formerly, says Entick, enclosed with a high brick wall, without allowing any footway for passengers on the outside. In 1760 the wall was removed, and the churchyard laid open; and in 1802 it was again enclosed by a dwarf wall and railing. Formerly, a nosegay from this churchyard was presented to every criminal on his way to execution at Tyburn. There is another burial-ground belonging to the parish, given by Sir William Selby; it is situated on the north side of the church.

In 1762, Parsons, the officiating parish clerk of St. Sepulchre's, was pilloried three times in one month, and imprisoned two years, and his wife one year, for the imposture of the Cock-lane ghost, which was managed by their daughter, under their direction.

In a report of the Holborn Valley Improvements, dated November 18, 1872, the line of the Viaduct involved the appropriation of a portion of the churchyard of St. Sepulchre's Parish, and the consequent re-interment of the bodies necessarily disturbed. A faculty was obtained from the Bishop of London for their removal to the City Cemetery at Ilford. A monument to their memory was erected in 1871.

In clearing the ground for the Viaduct, the western front of St. Sepulchre's Church tower was temporarily opened to view. The Estates Committee paid, in 1873, 4,200*l.* on behalf of the parish to the City so as not again to build in front of the church-tower.

On the boarded sides of the walls in the first stage, the bell-ringers' room, are inscriptions recording names, dates of new ropes, &c., from 1741 to 1830.

There were no masons' marks found on the masonry of 1450; but on the Portland stone reparations of 1670 and 1790 were discovered the cross with stopped ends, equilateral triangle, rhomboid, hour-glass form, the letters I, S, and T, the figures 2 and 3, &c. The masons employed on the recent restorations, have used twenty-nine different marks, all being cut in on the bed of the stones. Most of these marks are similar to those set forth in the "Archæologia," vol. 30, p. 113.

In 1873–5, the whole of the upper portion of the tower, from the main cornice, including the parapets, octagonal turrets, and pinnacles, were taken down and rebuilt. The scaffolding was entirely new, 200 ft. high, and erected entirely round the tower. There were 600 poles, containing 16,973 ft. run, at an average cost of 3d. per foot; sixty deals for transoms; 2,088 scaffolding cords, weighing 47 cwt. 12 lb., at a cost of 97*l.* 12s. 8d.; 260 scaffolding-boards, 5,000 wedges, 10,000 nails. It occupied eight men two months in fixing.

The turrets and pinnacles were found to be cased with Portland stone, averaging 8 in. in thickness, and cramped with wrought-iron cramps, 10 in. long, 2 in. wide, by ¾ in. thick, set in about 4 in. from the external air. The core of the turrets and the pinnacles was filled with rubble, and some of the crockets, embattlements, and gargoyles with lions' and other heads, belonging to the Perpendicular church of 1450. The crockets were so slightly worked as scarcely to bear resemblance to leaves. Portions of two finials were found, octagonal, plain, and not foliated. The hole for the vane-staff in one was drilled, and the other punched. Prior to the Fire of London, before the removal of the embattlements on the turrets, they had been partly restored with Portland stone.

The pinnacles and vanes were more modern than the tower. Strype records, "anno 1630, the charge of taking down and new building of one of the great pinnacles of the steeple appeared, by the accounts and bills examined, to be 139*l.* 19s. 4d." The remaining three were rebuilt 1632 and 1633, when "three vanes" were set up, answerable to the former vane on the other pinnacle.

The histories of London give various measurements of the height of the tower. Entick, in 1766, says that "the height of the steeple to the top of the pinnacles is 146 ft."; Noorthouck, 146 ft.; Clarke, 140 ft., &c. These are all incorrect; the height from the ground to the top of the pinnacles, accurately measured before they were taken down, was 152 ft. 9 in., thus:—

	Ft.	In.
Height of the tower to top of parapet	115	0
Height of octagonal turrets from top of parapet	12	6
Height of pinnacles from turrets to caps of pinnacles	25	3
	152	9

Exclusive of the vanes, which were of copper, 9 ft. 6 in. high, and 4 ft. 9 in. long, with a ball and a cross on the top. The parapets were 14 in. in thickness. The width of the tower is 26 ft. 4 in., equal to four squares in height. The internal dimensions are 16 ft. 5 in. by 16 ft. The walls of the tower are 6 ft. thick, cased with Kentish rag 8 in. thick, and filled with chalk; the belfry is internally of brickwork.

The tower originally stood upon large pointed arches, open to the nave and aisles, but now filled up and supported by piers. Upon scraping the tower over the arches the masonry was found to be of Kentish rag, nicely squared and dressed. There are eleven bells, but one is not rung with the rest. Weight of tenor 32 cwt. One bell for many years has announced the executions of prisoners at Newgate.

Mr. Robert Dowe, in 1605, left 50*l.* to the parish for the delivery of an address (printed in Maitland's "History of London") to the prisoners in Newgate, on the night previous to their execution. Mr. Dowe was buried in the church of St. Botolph, Aldgate.

The internal length of the church, exclusive of the tower, is 126 ft., and the width 62 ft. 4½ in. St. Stephen's Chapel is 36 ft. 6 in. by 15 ft.

Let into the Portland stone cornice round the tower was a band or belt of wrought iron, 5 in. by 1½ in.

The original floor of the tower was 14 in. below the present level. Several ornamental encaustic tiles were found belonging to the floor of the original church. The turret staircase begins in the south-west angle; fifty-six steps, with 8½-inch risers, conduct to the first stage, or floor; crossing the floor to the staircase continued in the north-west angle, thirty steps lead to

the second stage; crossing this floor to the north-east angle, thirty-one steps lead to the belfry-stage, and forty-one additional steps conduct to the lead flat of the tower; making a total of 158 steps. All the doorways of staircases have Tudor arches. The ceilings of turret staircases were of stone, and groined. In the south-west turret were formerly two openings: one a hagioscope looking into and through the tower, and the other was a doorway leading to the west window.

All the windows of the first, second, and belfry stages were pointed in two heights, with cinque-foiled heads. The tracery in the window-heads was panelled and trefoiled. An original window was found in the first stage, west side; and in the scond stage, south side. This latter was discovered on removing the clock. The clock front was of Farleigh Down Bath stone, in good condition, set in Roman cement. It had a crown in half relief on it. The tablet had an architrave and pediment, supported by trusses; on the architrave was A. R.

In the second stage on the south side, by the turret-door is the Curfew-bell. And in the angle of the north window is a lead urinal inscribed with

$$17_S\ P\ S_{85}$$

The parapets are now embattled, and pierced with cinquefoil-headed and quatrefoiled openings. The turrets are 7 ft. in diameter, panelled in two heights, cinquefoiled, and embattled, with bosses at the angles 1 ft. in diameter. The pinnacles are crocketed with finials and vanes. On the main cornice are twenty-eight bosses, 1 ft. 6 in. in diameter. All the bosses, sixty in number, are boldly carved with the heads of lions, fleurs-de-lys, roses, Tudor flowers, foliated heads, and cruciferous and other flowers; no two are alike; they have been sculptured from my detailed drawings, and selected from buildings in this country, of the fifteenth century date. The weight of the four turrets and pinnacles is 280 tons.

The total height of the tower to the top of the pinnacles, as restored, is 149 ft. 11 in., exclusive of the vanes, which are 10 ft. high. The original windows of the tower were of Kentish rag, 12 ft. by 5 ft., the tracery being of Ketton stone. After the Fire of London, or just before, plain pointed windows in two lights were inserted, without tracery or mouldings, all being of Portland stone. The central mullion was retained in its position by a wrought-iron bar passing horizontally through the centre of the mullion, 1¼ in. thick, flat, and 1 in. in diameter, circular through the window openings, and at each end in the form of a spade jagged on the edges, and inserted in each side jamb of the window openings. These iron bars were much corroded.

Of the west window, excepting the internal jamb mouldings, the original opening, 17 ft. 6 in. by 9 ft. 7 in., only remained. A new window is now inserted, in four lights, transomed, with cinquefoiled heads. Perpendicular foiled tracery fills the window-head. The west windows of the north and south aisles are new, in three lights, cinquefoiled, with tracery in heads.

The west doorway, of which much remained, was entirely of Kentish rag. This has been entirely restored; the label is in one stone, 11 ft. 6 in. in length.

The whole of the tower windows are new, in two cinquefoil-headed lights, with transoms and tracery as before, surmounted by finials, and crocketed labels, with foliated bosses or terminals. The external facing of the tower was principally of Kentish rag. The buttresses have been repaired, and gablets 6 ft. by 4 ft. added, with finials, crockets, and foliated bosses.

All the remains of the Gothic churches in London and Westminster which were damaged by the Fire of London were barbarously spoliated by Sir Christopher Wren, and however excellent his geometrical knowledge of construction and of Italian architecture may have been, he was grossly ignorant of the details of Gothic architecture.

To return to the porch; the walls, 3 ft. wide, were found to be in a ruinous state, and veneered or cased with Portland stone 1½ in. thick. The pinnacles, embattlements, niche and statue of Sir John Popham, were all swept away, and a semicircular-headed Italian window, with a bull's-eye window substituted; and the beautiful example of fan-tracery, and its bosses, nicely (!) compoed into an ignorant "restoration."

The porch as now restored has an entirely new circular Portland stone turret-staircase leading to the lead flat. The embattlements, all the pinnacles, the outer doorway, and the whole of the windows are new, all their features being restored. The bosses or terminals on the pinnacles are now decorated with the leaves, flowers, and fruit of the bramble, ivy, maple, oak, passion-flower, shamrock, whitethorn, vine, &c. There are two rooms over the porch, 18 ft. 6 in. by 12 ft. The room immediately over the porch is arched in 9 in. brickwork, with stone ribs. The haunches are filled with earth. The room is 9 ft. 10 in. high. It is to be regretted that an oriel window has been substituted for the niche and statue of Sir John Popham over the outer doorway. The latter were restored in the contract drawings and included in the restoration, but, notwithstanding my protest, the churchwardens insisted upon having an oriel window, which however well adapted for gentlemen's halls, is entirely out of character in a porch. The statue of Popham, similar to "Old London stone," formed one of the landmarks of the City, and would have vied with the statues recently introduced on the Holborn Viaduct.

The Council of the "London and Middlesex Archæological Society," usurping beyond its orthodox functions, submitted plans and sections for the re-modelling of the body of the church, and urged that "it would be undesirable to make the church itself to match the old tower and porch in style of architecture, for several reasons; but principally because the interior is more than an average fine specimen used by Wren in rebuilding the City churches after the Great Fire." The incapacity of an "Archæological Society" to express an opinion on architecture *per se* was never more apparent than in the present instance. Now, in what does this "more than average fine specimen of the style" consist? All the remains of Wren's work are a dozen *quasi* Doric columns, and the altar-piece. All the windows are the old Gothic openings, with semicircular heads added, without a single moulding; the whole of the roof over the entire body of the church was put on in about 1837, and consists of lath-and-plaster groining, with doves, &c.; the springing of the arches rising from the centre of each window opening!

The tower and porch having been restored, there can be but one opinion respecting the body of the church, viz., to restore it to its original state; all the old walls and finely-proportioned window openings remain, including St. Stephen's Chapel.* An open-timbered roof, and the clustered columns in their original positions, would complete the restoration of the nave and aisles as formerly. In 1836, 12,000*l.* were asked for, to restore the nave of St. Saviour's Church, Southwark, and in 1839 a tender was accepted to destroy it, and to build a new nave in its place, at a cost of 8,000*l.* Upon the completion of the building it cost 12,000*l.*, being the same amount that would have restored the ancient nave in its original entirety.

The whole of the stone used in the restoration of the tower and porch was from the Ancaster stone quarries, viz., the fine white and crown freestone, weather bed, laid on its natural bed. All the mullions of the windows are of Ketton stone, and glazed with lead quarry lights by Mr. Denton. All the carvings were executed by Mr. Hibbins. The vanes were made by Messrs. Hart & Son. The contractor was Mr. Lidstone, and the clerk of the works Mr Mallcott. The total cost was 4,726*l.* The whole of the works have been executed from my designs and superintendence. W. Pettit Griffith, F.S.A.

* The view given on p. 755 shows the body of the church as suggested to be restored.

OR SAN MICHELE.

Or San Michele is like no other church in Florence. It is like no other church the world over. It was never intended for a church, but was built by Arnolpho, by order of the Signoria, for a corn-exchange, as we should call it. Taddeo Gaddi turned it into a church, and it was still further altered at a later period by Orcagna. It makes but a small church, though it is a very lofty building, but there are two other floors above the church, which only occupies the ground story. In Or San Michele you breathe the atmosphere of ancient Florence, which you cannot do in the neighbourhood of the railway-whistle and the brand-new houses of the English and Americans. Among all the old places in the old city none is less changed than Or San Michele. It stands in the busy Via dei Calzajuoli, and thus occupies a position between the two most famous piazzas of the city,—the Piazza della Signoria and the Piazza del Duomo. On its western side is the ever noisy Murcato Vecchio, and scarcely more than a stone's throw from its eastern front are the fragments of the most interesting house in all Florence, that of Dante.

The building is almost square. The ground-story is divided into lofty arches, which spring from massive piers of masonry, thus preserving the tradition of the old Loggia. These arches that were once open to the floor within, are walled up to the springing-line of the arch, and the head of each arch is filled with unusually rich geometrical tracery and stained glass. In the centre of every pier, at about a man's height from the ground, there is a white marble niche, with an overhanging canopy, built into the thickness of the pier. Each niche has a bronze statue in it, or more than one. Donatello's St. George is the only marble statue in the series. The walls around are black and stained with the rain and smoke of centuries; but the niches glitter with the whiteness of Carrara marble and gold mosaic. Ages ago, when the Arti Maggiori and Minori were flourishing and rich corporations, they dedicated each a statue to their protecting saints. These money-changers and silk-mercers, farriers and butchers, selected their men of art, as your noble connoisseurs might do now, and drove hard bargains with a Giovanni da Bologna, a Ghiberti, a Donatello. The butchers gave a St. Peter,—a grand old fellow, book in hand. The dust of ages lies thick upon the folds of his robe. Above the pointed gable of his niche are the arms of the guild in a circle of Robbia ware. The shoemakers gave a St. Philip. The joiners, the stonecutters, the masons, and the smiths clubbed together and filled one niche with four saints, who can scarcely find standing-room. On the base of the niche their various pursuits are carved. The mason builds his wall, the joiner smoothes his wood, the carver carves his statue. This is a glimpse into the workshops of five hundred years ago. The armourers and sword-makers dedicated a marble St. George,—the famous St. George of Donatello. There is a plaster cast of this statue in the South Kensington Museum, but perched as it is on a couple of exhibition-cases and divorced from its beautiful niche, it has little of the effect of the famous original. The youthful saint fills his niche with an air of splendid alertness. He is bare-headed, and wears a cuirass and greaves. With his left hand he grasps his red-cross shield. The marble canopy above him is carved in many intricate ornaments, and little angels spread their wings and fold their arms upon its pinnacles. The money-changers gave a St. Matthew. Their arms are conspicuous above the niche,—a shield thickly sown with golden florins. The Guild of Wool dedicated a St. Stephen. The blacksmiths gave a St. Lo. The furriers gave a St. James. The rich Guild of Silk gave a St. John. The justices and notaries gave a St. Luke. These statues are a series of ideal forms, of varying merit no doubt, but yet the work of mighty artists, and the gifts of mighty traders. The stone blackens and crumbles away by degrees. The carved marble is eaten into by wind and sunshine, but these graven apostles will outlast the very rocks. Long ago, when the church was still a loggia, and busier than the busiest of the remaining loggie are now, there was a wonderful Madonna upon one of its piers. She was a compassionate saint; she wrought miracles,—at least, everybody in Florence believed that she did. The grandest artist of the time was commissioned to build a shrine for her, which is the glory of Or San Michele to-day. This tabernacle is a jewelled pyramid that flashes its hundred rays through the dimly-lighted church. Open arches on three sides, springing from the angles of the shrine, support a roof, vaulted below, but domed on the exterior, that overshadows the altar within the parallelogram. The picture of the Madonna is placed over the altar, surrounded by worshipping angels, bearing lilies and palms, and musical instruments. Numerous heads of the apostles and seers lean with their mottoed scrolls from the arches and piers. The history of the Madonna is carved on the base. The marriage and annunciation, and the death and the assumption, the birth of the Holy Child, the visit of the kings, and the presentation in the Temple. These are all sculptured in the creamy marble, soft and shadowy with age, and the blue and rose, and amber and gold, of mosaic form a border about them. Devotion, Temperance, Perseverance, Humility, Truth, Docility, are the virtues that stand at the angles of the piers.

This is the Capo d'Opera of Orcagna, in marble. Through ten years he wrought with his own hands in the carving of the bas-reliefs. The cost of the entire work was 86,000 gold florins. Before leaving, the visitor should seat himself for a moment on one of the benches that are placed parallel with the sides of the shrine, and look through to the painted window beyond. By so doing the Tabernacle receives its glorification, and is a truly beautiful vision. The arches appear to enclose the richest, most mysterious colours, the very splendour of the setting suns. Eternity is typified in the marble calm of the shrine, and life, and its mystery of sadness and fugitive brightness, in the colours of the window. All the windows, with one or two exceptions, still retain their ancient glass. Although the area of the glass bears but a small proportion to the size of the space between the piers, the windows are by no means ineffective. Each one glows, jewel-like, in its setting of grey wall and shadow. S. D.

DISCOVERY AT LAVENHAM, SUFFOLK.

The Suffolk Archæological Institute have had an excursion, and, amongst other papers laid before the meeting,

Mr. Dewing read the following notes relative to a recent interesting discovery at Lavenham :—A short time ago Professor Churchill Babington drew my attention to the discovery of an early kiln or oven at Lavenham, intimating that from the description he had received, it might turn out to be the work of the Romano-British period. This discovery was made upon the property of Mr. William Biddell, of Lavenham Hall, and by his kindness I had an opportunity of seeing it. The kilns or ovens were found when digging for gravel in a pit close to Lavenham Hall, and near the site of the house of the De Veres, the remains of which are still visible in front of the present hall. Entering the gravel-pit from the road, the kilns are seen in section on the opposite side, and a stranger may well be forgiven if his first impressions are in favour of Roman work. The kiln is double, like two wagon-shaped steam boilers lying side by side. In fact, the section is very much that of a wagon-boiler. A single course of hard floor-bricks is laid upon the surface of the gravel, on a thin bedding or layer of clay, which the heat has rendered hard and friable, subject to the original deposition. Over this floor two barrel arches are turned, 3 ft. wide by 2 ft. 3 in. high, the crown of the arch being somewhat depressed. The depth of the kiln and the length of the barrel are not less than 12 ft. I have said that the floor is of hard bricks. These measure 10 in. by 5 in. by 1½ in., are unglazed and more burnt on one surface than the other from the heat of the kiln. The arch itself is entirely formed of flat roofing tiles of a red coarse make, averaging, I should say, 6 in. square, but as I could not extract a perfect specimen, I am not quite sure about the dimensions. They are ⅝ in. to ¾ in. thick, and average 14 courses to the foot, so that the layer of clay (for the tiles as well as the floor bricks are laid in clay) is nearly as thick as the tile. The haunches of the arches are filled in with a soft red brick, measuring 9 in. by 5 in. by 2½ in. The surface of the ground around is covered by broken pieces of tiles, and below the surface may be traced a layer of shells, the whelk and oyster predominating. I found no pottery, but had little time for search: one piece of glazed tile I picked up, but I think it accidental. The Roman theory of the origin of the oven I must think untenable. The character of neither the bricks nor the tiles supports it; nor does the form of the kiln agree with such accounts of Roman kilns as I am acquainted with. On the other hand, the bricks are not modern. The tiles might pass for modern flat roofing tiles, but the hard bricks are certainly not modern. Similar bricks of modern make measure 9½ in. by 4½ in. by 1¾ in., whereas these measure 10 in. by 5 in. by 1½ in., *i.e.*, they are longer, wider, and thinner than modern-made hard bricks. At first I thought, led by the large quantities of broken tiles lying about, that the kilns might have been connected with tile-making. But the same thing occurs elsewhere in the neighbourhood, and the kilns do not appear adapted either by their form or by their heating powers, for the burning of tiles. It will be observed that there is no furnace nor apparent means for heating these kilns; we are, therefore, driven to the conclusion that they must have been heated somewhat after the manner of a modern baker's oven—by wood. Some years ago a kiln was discovered at Malvern, which was so far similar to these that there was an aperture for the escape of smoke, and it was evident from the remains that charcoal had been used for firing. Charcoal was, therefore, in all probability, the heating medium at Lavenham. It would seem not unlikely that these Lavenham ovens were used in the manufacture of the soft common pottery which satisfied the wants of the district about the seventeenth century. If so, it is remarkable that the kilns differ in form from those in use among the early Staffordshire potters, which were of a round coped form, about 6 ft. wide and 8 ft. high; were it not for this difference I should have put forth this suggestion with some confidence, as it is borne out by the name of the Potters' Field, which the place bears. As it is I hesitate, and leave it to others to supply my deficiencies.

Professor Babington, being called upon by Mr. Dewing, said he could have wished to say nothing about the matter until he had had an opportunity to make more accurate investigations, but he thought from their surroundings,—pieces of pottery, &c.,—that the remains spoken of by Mr. Dewing were unmistakably Roman. The arches seemed to be Roman, and the occurrence of whelks with oysters, in thick layers, encouraged this presumption, for these were commonly found about Roman villas. The professor produced a fragment of the neck and lip of a vessel picked up on the spot, which he thought might have been the site of a Roman villa, and of a manufactory of pipes or something else at a later period. The structure of the tiles did not seem to be Roman, and the whole matter required further investigation. He was inclined to think they were hypocausts.

SALES OF FREEHOLD ESTATES AND BUILDING LAND.

On the 10th inst. Messrs. Farebrother, Clark, & Co. offered for sale at the Mart, Tokenhouse-yard, several valuable freehold estates, situated in the counties of Middlesex, Hertfordshire, and Wiltshire respectively, the estimated value of which was upwards of 200,000*l.*

The first lot of property submitted was a residential estate, together with a quantity of building land, situated near the village of Great Stanmore, Middlesex, containing an area of a little more than 11 acres. The property was stated to be about three miles from the Harrow Station of the London and North-Western Railway, and within two miles of the Edgeware and Highgate line, and was further described as being well adapted for building purposes, in consequence of additional railway communication which would shortly be opened out, bringing it within easy access from the metropolis. The upset price was 4,000*l.*, and the property was sold for 4,350*l.*, being at the rate of about 400*l.* per acre.

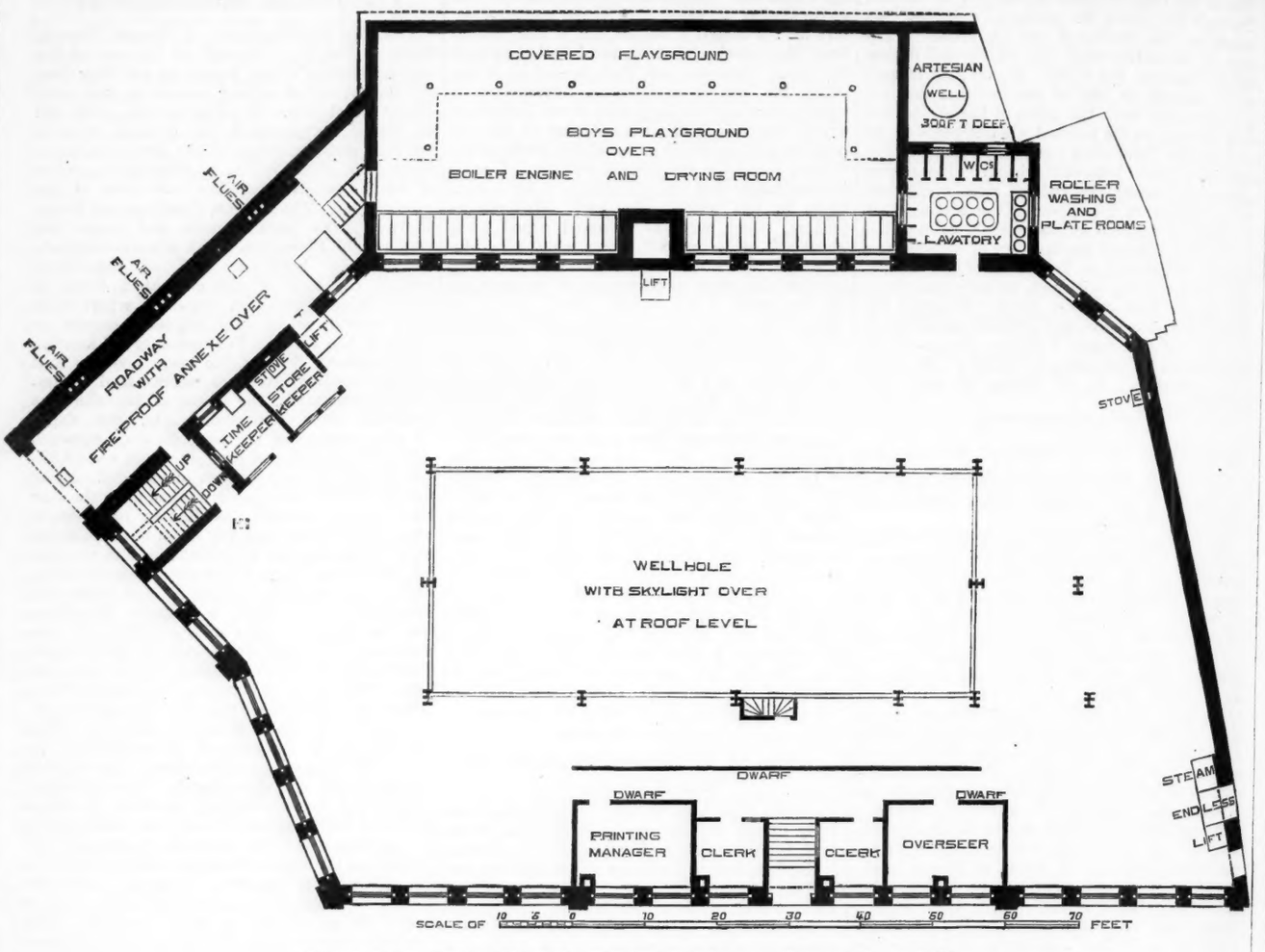
A number of extensive estates in the parishes of Aldbourne and Wanborough, Wiltshire, containing in all 2,330 acres, were submitted to competition. These estates were in five lots, the several lots containing respectively 790 acres, 537 acres, 184 acres, 390 acres, and 425 acres, the aggregate annual rental being stated to be 2,054*l.* The first lot, containing 790 acres, was put up at 13,000*l.*, the biddings going on by advances of 100*l.* each, until the property stood at 16,000*l.*, at which sum it was knocked down. The first offer made for the second lot, containing 537 acres, was 12,000*l.*, and the property was ultimately sold for 13,500*l.* The offers for the three next lots not reaching the reserve, they were withdrawn. The sum realised for the lots sold amounted to about 25*l.* per acre, as compared with 400*l.* per acre which the Middlesex property commanded.

London Bridge.—The Bridge House Committee have just issued a report. According to it, there are, on an average, 116,284 horses led or ridden, and of vehicles of every description, and 611,217 foot-passengers passing over the bridge every week. Mr. Horace Jones, the City architect, and Mr. C. H. Gregory, civil engineer, concur in thinking that the reference to the committee would best be met by widening the bridge to the extent of 22 ft.,—11 ft. on either side,—but not on the cantilever principle, since they viewed with serious apprehension the possibility of a balcony sustaining a load of upwards of 500 tons. They would not tamper with the stability of the present structure, and suggest a scheme that would cost 55,000*l.* The committee agree that this expenditure should be incurred.

A NEW MODEL PRINTING-HOUSE.

The new printing-house of Messrs. Cassell, Petter, & Galpin, is situated on the site of the ancient Carrier's Inn, known as the New Inn, Old Bailey, and of several houses on the south side of Fleet-lane. It abuts on the north end La Belle Sauvage-yard, the present publishing and printing-house of the firm. It has a frontage of about 232 ft. to Fleet-lane; a view of which we give, together with plan of the ground-floor. The London, Chatham, and Dover Railway runs parallel with and forms the west side of Fleet-lane. The site was formerly the sloping bank or cliff of the Fleet, and at the base of the cliff at a depth of 18 ft. below Fleet-lane, retaining wharf walls were traced, which had adjoined creeks or docks of the Fleet. The necessity of keeping the basement floor at the same level as that of the existing premises necessitated an immense excavation, the whole of the cliff was removed over the entire site, the depth of the excavation at the east end exceeded 40 ft., the quantity of earth removed was 18,378 yards, and in consequence of the difficulty of access thirteen months were taken up in the slow and tedious process. A Roman sarcophagus was opened about half-way down the cliff, and is now in the museum at Guildhall. The skeleton of the Roman found within the coffin was plundered piecemeal, by antiquaries and others and dispersed. To obtain a reliable foundation for the massive walls of the building, it was necessary to excavate a still further depth, until the blue clay was reached, and the trenches were filled up with concrete. On the east of the site a spring of water was cut through, strongly charged with salts, especially nitrates. This spring has to be pumped up continuously to the level of the sewer in Fleet-lane. Its medicinal qualities are not appreciated. The principal purpose of the new building, to which all others are to a certain extent subservient, was to obtain a machine-room for thirty-six large printing-machines, arranged under supervision of one commanding superintendent, the great desiderata being to secure an abundance of light, so as to avoid the use of gas as far as possible. This machine-room occupies the area of the basement of the new building (12,600 ft.). There will be no bands or shafting visible in the machine-room, the bands to each machine working in trenches sunk beneath the floor, and the work will therefore proceed without vibration. The flooring will be of hard bricks, with teak-wood pathways. The walls are lined with glazed white bricks to a height of 7 ft. The machine-room is lighted by a central well, 70 ft. by 30 ft.; roof carried up to the top floor, and covered with a light glazed roof. There are five floors above the basement. The ground-floor will be principally occupied as the printing-office warehouse. The space over the drying-room is to be an open playground for the boys.

The first floor contains the administration, both financial and editorial; here also will be the library, private rooms, and conference rooms, a large schoolroom, two dining-rooms for the men, kitchen, &c. The second floor is given up almost wholly to stock. On the third floor will be placed the hand-presses where the lighter kind of work in printing is to be done; and the whole of the fourth floor will be the composing-room, well lighted, ventilated, and regulated in temperature, every means to these ends having been considered, and, where practicable, adopted. The large tower at the south-west contains a nest of separate airy and spacious reading-rooms for the "readers"; there is an annexe of fireproof character on the east side on all floors forming a buffer against the spread of fire, where only the new building abuts on adjoining property. These fireproof-rooms will be used as stores for plates, woodcuts, &c.; also for stereotyping, electrotyping, and other processes. The water-closets and lavatories are contained in a tower of nine stories, having access from each floor, but separated from it by a lobby. The water supply to the whole building has been happily secured by an artesian well. The water will be stored in five wrought-iron tanks, containing together 80,000 gallons, the highest tank being at an elevation of 110 ft. above the basement floor. There are two fire-cocks on each floor and on the roof, and tons of water can in one minute be thrown upon any point. The access to the building is by a fire-proof workmen's staircase at the north-east angle, and a stone public staircase at south-west angle, but there is also a continuous steam-lift for the use of the



NEW PRINTING HOUSE, FLEET LANE.—*Plan of Ground Floor.*

establishment only as fixed at the General Post-Office. The method of heating and ventilating is a modification of Captain Galton's system, as applied to the latest barracks. The elevations to Fleet-lane are of a massive business-like character. The material used is Portland stone to the level of the first floor, and white Suffolk bricks and terra cotta above. The whole is being carried out from the designs and under the superintendence of Mr. Francis Chambers, architect, who is represented on the works by his assistant, Mr. J. R. Wilson.

The arrangements for carrying on the various mechanical processes, &c., within the building have been so contrived as to economise manual labour as much as possible. The paper, as it comes from the mill, will be placed in a series of basement warehouses, from which it will be taken as required, and passed into the wetting-room, then smoothed by means of steam rolling machinery, and driven upon tramway trucks to the printing-room. Having been printed upon, it will be raised by a steam lift to the counting-room, and passed through a drying process. It will then ascend to the next floor, and be pressed by powerful hydraulic machinery, after which it will be carried, by means of the endless lift, to the binding-room, and thence conveyed down to the publishing-offices, thus making a circuit of the building.

The printing machinery is of various kinds, the most part being especially constructed for producing works illustrated with fine wood-cut engravings, the whole being, as before mentioned, driven by shafting placed beneath the basement level, and resting upon isolated foundations.

The boiler-house, which is outside the walls of the main building, contains three of Galloway's boilers, each measuring 22 ft. by 6 ft. 6 in., and adjoining is the engine-house, to contain two pairs of Tangye's horizontal engines, each pair being of 36 H.P.

The composing-room, which is noteworthy, will accommodate 200 workmen. It is well lighted, well ventilated, and fitted up with every necessary appliance besides especial provision for the personal convenience and comfort of the men.

The "readers," whose fate it is too often to be located in small, ill-ventilated closets, exposed to the noise and vibration of machinery, will occupy a suite of quiet rooms (at the summit of a tower), which have been constructed with a special view to their health and comfort.

The process of electrotyping, which involves the escape of irritating gases, will be carried on in a separate building, so arranged as to reduce its deleterious effects to a minimum.

Provision has been made for a workmen's kitchen, where food will be provided for the men and boys at the lowest rate, and the boys will have the use of a playground and gymnasium during the dinner-hour—and thus avoid the common practice of running about the streets.

The total number of persons employed upon the premises, including men, women, and boys, will be about 750, and some idea may be formed of the extent of the operations carried on by the mention of the fact, that exclusive of the production of an array of volumes in almost every department of English literature, the separate parts of the magazines and serials issued each month considerably exceed half a million. The paper shavings trimmed off the edges of the serial publications amount to 25 tons a year, while the other waste, including paper accumulating from the strict rejection of all imperfect impressions, exceeds 50 tons.

THE CONTRACT FOR THE LAMBETH NEW INFIRMARY.

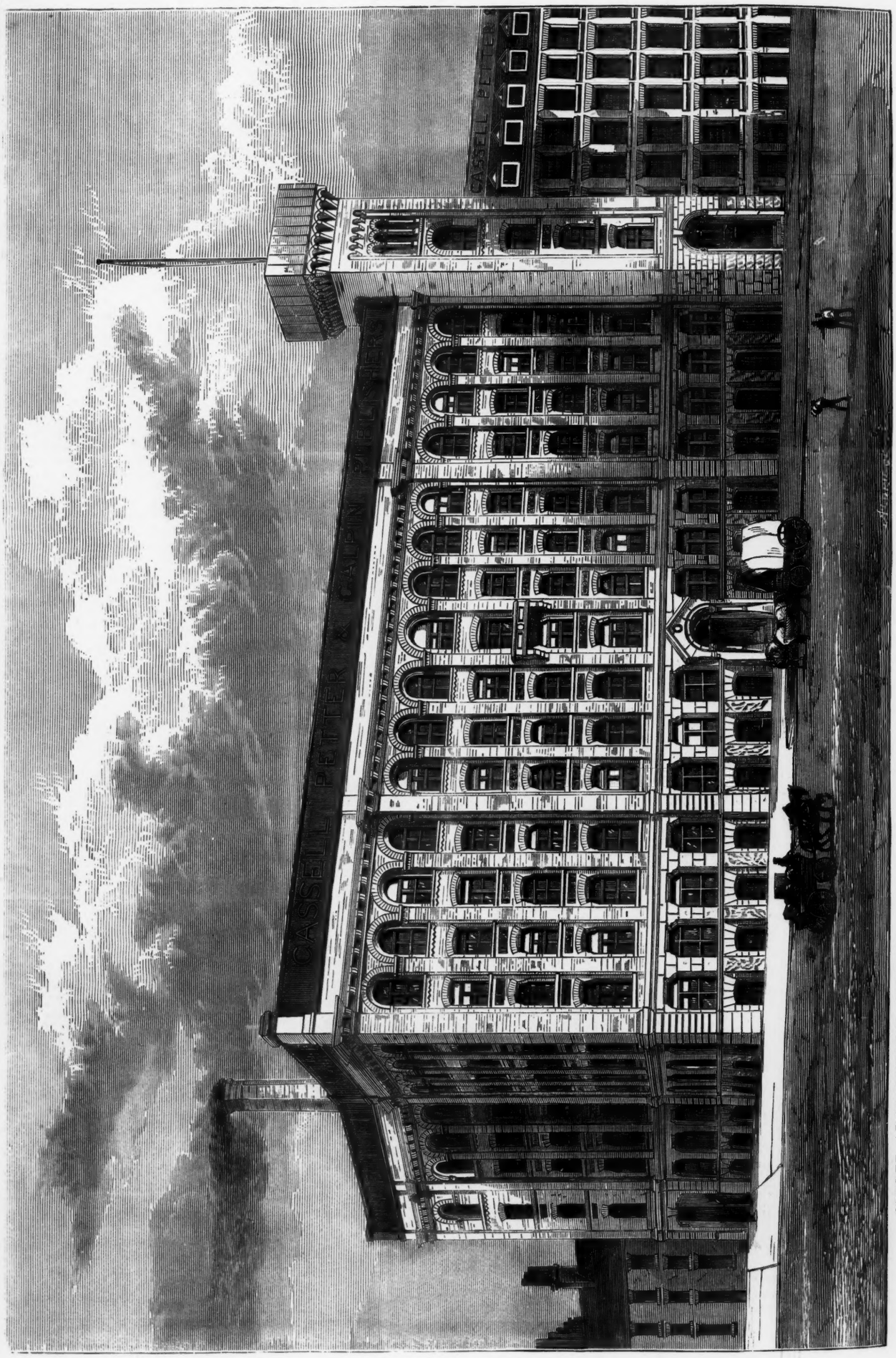
At the meeting of the Lambeth Guardians last week, the tenders for the new infirmary, outdoor labour buildings, receiving wards, and other buildings, which are about to be erected from the designs of Mr. Fowler, architect, were opened. They were fifteen in number. The tender of Mr. J. H. Tarrant, of New Kent-road, to erect the infirmary for 51,200*l.*, the receiving wards and other buildings, 1,540*l.*; and the outdoor labour buildings, 460*l.*; the total being 53,200*l.*, was accepted, subject to inquiries into Mr. Tarrant's financial ability proving satisfactory. A conversation ensued with respect to the question as to whether the other contractors might withdraw their tenders, and the Board be compelled to go through the process of inviting tenders again, in the event of the inquiries respecting Mr. Tarrant's financial position proving unsatisfactory. In order to overcome this possible difficulty, Mr. Taylor suggested that the Board should not definitely accept any particular contract until they had made all the inquiries they intended to make, and that the contractors be informed that the Board would decide the question at their next meeting. Mr. Taylor's suggestion was ultimately adopted.

WARRINGTON SCHOOL OF ART.

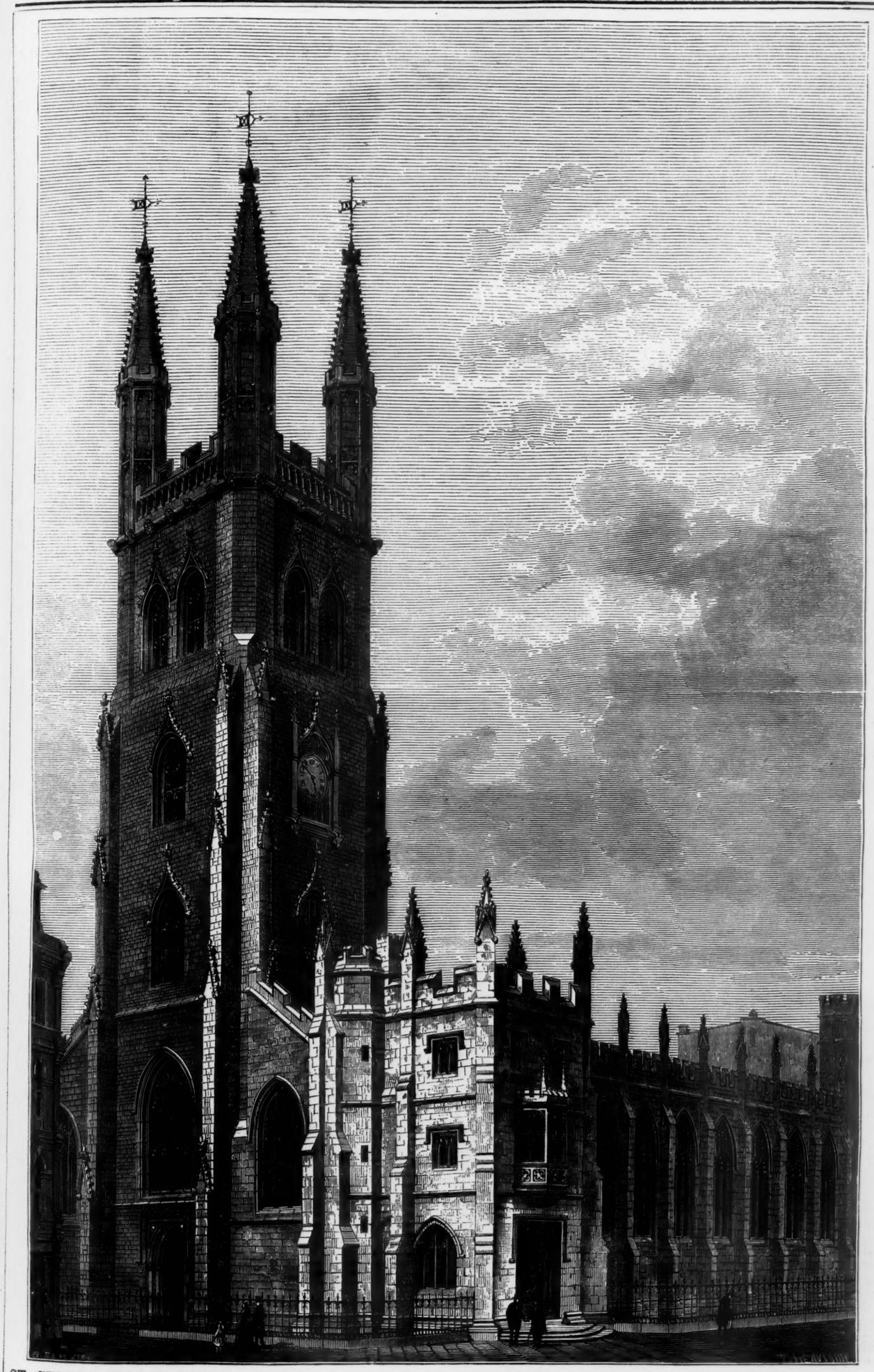
PROPOSED NEW BUILDING.

On the 11th inst. a meeting of subscribers and others interested in the Warrington School of Art, was held in the Museum, for the purpose of receiving a report from the sub-committee in reference to the erection of a new building for the use of the School of Art. The chair was taken by the mayor (Mr. Chandley), and there were also present—Mr. Alderman Holmes, Rev. O. H. Cary, Rev. J. B. Johnstone; Messrs. Bleckly, John Rylands, Brewtnall, S. Webster, Chas. White, Sharpe, Marson, Whittle, Crosley, Ellison, and Edward Milner, hon. sec.

Mr. J. Rylands proposed a resolution, "That it is desirable at once to secure the land, or a portion of it, offered by Lord Winmarleigh, and that the council of the School of Art be requested to open a subscription list, and proceed as soon as possible to secure the land"; which was carried, as also that proposed by Mr. Marson,—"That the Council of the School of Art be requested to prepare plans of the building required, and when ready submit them to a meeting of friends and subscribers after they have been approved by the Department of Science and Art."



STREET ARCHITECTURE, LONDON.—Messrs. Cassell, Petter, & Galpin's New Premises, Fleet Lane.—Mr. Francis Chambers, Architect.



ST. SEPULCHRE'S, HOLBORN VIADUCT.—TOWER AND PORCH, AS RESTORED BY MR. W. P. GRIFFITH, F.S.A., ARCHITECT.

[See p. 749, *ante*.

ON HAMMERS.*

It is hardly possible to draw a distinction between a tool and a machine; the former is more simple than the latter. They so merge each into the other that it is difficult to say where the one ends and the other begins. A lathe, for example, is a handicraft tool, and yet in its ramifications and developments it becomes a very complicated machine. As a machine we are not concerned with it,—as a tool it might legitimately be classed in this course of lectures. It was, however, one of the earliest to be erased from the first list; now, however, it has for associates a goodly number of tools in far more general use than itself, which one by one have been set aside. It may be asked, What is a tool? How is it defined? Questions not easily answered. For our present purpose, it will suffice to state that an implement by which the power of man is enabled to change the physical forms of materials is a tool. If to this implement there be added appendages, which either extend its range or vary its mode of application, these appendages are "contrivances." There may, however, be contrivances not connected with tools as now defined, and then they are elevated to the dignity of tools. For example, a chisel or a hammer is a tool; the boxing with which the former is surrounded, as in a plane, and the handle attached to the latter, are contrivances, for by them the modes of application of a chisel and the powers of a hammer are extended and varied. A vice, a soldering-bit, a nail, a square, are not tools, but "contrivances" only.

Viewed thus, it may be said that by means of tools and contrivances man is enabled to increase and vary the human power, to economise human time, and to convert substances apparently the most common and worthless into valuable and useful products. Without tools the hand would be nearly powerless; add to it a hammer and a cutting instrument, and its capacity is increased many fold. Whoever contrived rollers as a means for moving heavy blocks of stone added a contrivance which very largely extended the powers of men. Whoever first applied grease to bearings and surfaces enabled man to utilise a much larger portion of his power. Whoever first, in truly geological prehistoric times, made an eye and a point in and on a strip of bone or shell, gave to man as a tool an invention far exceeding in importance and value anything yet accomplished by heat or electricity. Whoever in these same times applied a barb to a spear and a hook, introduced a contrivance of very high and inestimable importance.

The most ancient of tools is the hammer. In all parts of the world and amongst all people hammers may be found in use. So general are they that even the name "hammer" seems to have a pre-historic origin, for etymologists tell us that the word "hammer" is common to all the northern languages.

A tool more simple and more useful than the primitive or handicraft hammer cannot be found. Yet it has been so little esteemed during the countless ages since the first was made, that so far as your lecturer's researches have penetrated, the hammer does not possess any literature. This may be illustrated by reference to the encyclopædias, *e.g.*, "The Penny Cyclopædia" in its thirty volumes, and "The Edinburgh Encyclopædia," do not contain in alphabetical order the word "hammer." The "Encyclopædia Metropolitana" and the "London Cyclopædia" dwell upon the word "hammer" chiefly in its figurative sense. "Rees's Cyclopædia" has "hammer, an instrument of iron with a handle of wood, used in most mechanic arts to beat, stretch, drive, &c." The "Encyclopædia Britannica" and the "Oxford Cyclopædia" use terms similar to those employed in Rees. "The English Cyclopædia" speaks thus disrespectfully of this most primitive, ancient, and universal tool:—

"*Hammer.*—It will not be necessary to notice the hammer as a mere tool, but its importance as a machine renders a description necessary."

More recently, and in a book specially devoted to the tools and contrivances used by artisans, and which volume has both a table of contents and a comprehensive index, the hammer is not even named in these. Like the scaffolding of a building, the simple hammer seems always to be cast aside, and the writers of the articles in the "Encyclopædia" have correctly interpreted the universal treatment. The machine contrivances worked by other than human power, and to which they attach importance, are those with which this course of lectures is not to be concerned.

Before considering such views as may have suggested many of the various materials and forms of hammers now in use, it will be well to regard the hammer in, and of, and by itself. We are so apt to look upon it as a rude implement, necessarily associated with a superior class of finishing tools, that the materials, forms, and scientific principles involved in its construction and use, not only as an adjunct to other tools, but as a sole independent and final tool, are much overlooked.

In some handicrafts, and those too involving a high class of finished work, the hammer is the only tool employed. That great artistic skill in the use of the hammer, as a finishing tool, can be acquired is manifest from the beautiful illustrations of *répoussé* work to be found.

But we should be ignoring the skill of those who have gone before us, if we allowed ourselves to dwell exclusively upon the work done by hammers as finishing tools in modern days. As the hammer was in all probability the first formed of handicraft tools, so it was with equal probability the first tool used for the formation and ornamentation of articles which, whilst still intended for use, were also regarded as worthy of ornamentation.

It may, perhaps, appear somewhat out of place to refer to the shield of Achilles, so fully described in the "Iliad" of Homer, book 18, in the last 150 lines.* But if any one can appreciate the value of a hammer—as an independent tool—then he will read either the original description of the metal work on this shield in the language of Homer himself, or, failing in ability to do that, he will be amply repaid by a thoughtful perusal of the translation, given by either of our late Premiers, Lord Derby or Mr. Gladstone.

Homer flourished about 960 B.C. (*i.e.*, 960 + 1875) 2,835 years ago, and although the shield to which allusion is now being made may not have been actually fashioned, nevertheless, the description is of that which a hammer was poetically supposed capable of accomplishing. Indeed, the forge in Homer's day is described as not inferior to some of those at our large armour-plate and "Woolwich Infant" manufactories.

The late Earl of Derby gives us as Homer's description of the forge at which Vulcan wrought,—

"The bellows then directing to the fire,
He bade them work; thro' twenty pipes at once
Forthwith they pour'd their diverse-temper'd† blasts;
Now briskly seconding his eager haste,
Now at his will, and as the work required.
* * * * * * *
Then on its stand the weighty anvil placed;
And with one hand the hammer's pond'rous weight‡
He wielded, while the other grasp'd the tongs.
And first a shield he fashion'd, vast and strong,
With rich adornment . . . . . .
. . . . . of five folds the shield was form'd;
And on its surface many a rare design
Of curious art his practised skill had wrought."
Book 18, *line* 528, *&c.*

The account of the shield itself is too long, but Mr. Gladstone has condensed (as a table of contents) the incidents embossed upon it by hammering and inlaying. These incidents, it will be observed, are very unlike the "various shields" in the hosts of Satan, for the latter were "with boastful arguments portrayed" (Milton's "Paradise Lost," book 6, line 84).

The scenes wrought upon the shield of Achilles are—1. The earth, sea, and heavenly bodies. 2. In a city at peace there are—(*a*) Marriage festivities; (*b*) A judicial suit or trial. 3. In a city at war there are—(*a*) A scene before the ramparts; (*b*) An ambush and surprise; (*c*) A bloody fight. 4. The ploughing of a field. 5. The harvest and the meal in preparation. 6. The vintage, with music and a march. 7. A herd of cattle attacked by lions. 8. Sheep at pasture and their folds. 9. The dance. 10. The great ocean river encompassing the whole, as, in the mind of Homer, it encompassed the earth.

Mr. Gladstone remarks:—"Never was outward fact so glorified by the muse. Nowhere in poetry is there such an accumulation of incidents without crowding. Of the twelve pictures on the shield, almost every one contains a narrative." All this is described as the result of hammer-work.

Although hammers and hammer-work have been in past ages thus highly esteemed, yet whilst hitherto, in modern times, literature has disregarded the tool pure and simple, the wealthiest in the land pay very marked respect and honour to the tool itself. The diamond within gives to the casket its worth, and the value of a gem may often be inferred from the setting in which it is placed. Judged by this standard, the hammer holds a patriarchal pre-eminence amongst tools,—a pre-eminence to which its antiquity and usefulness fully entitle it. Not royalty alone, but all who derive their authority either from royalty or wealth, and who adopt an English view, that honour is shown by excessive display and paraphernalia, cover with valuable cloth the box containing the hammer to be used in case their carriage meets with an accident. The sides of this cloth which covers the hammer, and the doors of the carriage which enclose the owner, are alike emblazoned with heraldic arms. Is it from deferential respect to this most ancient of tools that on the hammer-cloth is often a more expensive emblazonment than on the doors of the carriage?

For examples of the use of hammers in the production of works of great variety and extent on a large scale, see the ancient hammered wrought-iron gates, hinges, panels in the architectural room in the Museum at South Kensington, or (only of a different character, but still hammered work) the gates recently erected near the courts in Lincoln's-inn; also the various suites of mail and chain armour in the Tower of London; also the iron panels on the table, especially the beautiful iron spray formed out of the solid, without either welding or brazing; also the raising and embossing of metals to which your attention has been directed; the formation of gold leaf, the springs of carriages, and the stiffening of saw-plates.

The nature of work to be done by hammers calls for very great differences, not only in the form, material, and weight of the hammer-head, but also in the appendages to these. There are the material and form of the handles, the angle at which these handles should intersect the axial line of the hammer-head, the position of the centre of gravity with respect to the intersection of this axial line, the length and elasticity of the handle. If the centre of gravity is not in the central line or longitudinal axis of the hammer-head, then there is a tendency to bring the hammer down on the edge of the face and not on the face. If this defective construction were great, the muscles of the wrist may not be strong enough to counteract the tendency. If the defective construction is slight, then the work is often marked with angular indents. Arrangements, too, may be required for modifying the intensity of the blow, whilst retaining the effects resulting from a heavy hammer where a light one would be inefficient.

As the principles which govern the operation of small things may be best studied in large ones, so here. For this purpose we may at the outset regard the hammer as a weight at one end of a rod, of heavy or light, of elastic or non-elastic material, the position of the hand on this rod varying according to requirements (as the fingers of a violinist on the strings of a violin) and so modifying the effects of the hammer. Speaking generally, the effect is produced by allowing what we must call the head to fall through a space, and then come in contact with the material to be influenced by the blow. Perhaps, the object to be accomplished by the blows of hammers are more varied than those to be effected by any other single tool. It may be questioned whether there is any handicraft operative who carries through any branch of his trade without using what he calls, or what we may call, a hammer. Although under this general name each artisan understands a certain tool employed in his own trade, it does not follow that he generalises, and so extends his views as to comprehend all the varieties, both in material and form, which present themselves between the heavy two-handed maul and the smallest tapping-hammers of the jeweller and watch-maker, file-maker, and diamond-splitter.

It is curious to see how in the same trade the hammers are for different purposes made of different materials. The engineer, for example, uses hammers faced with steel hardened, the stone-breaker (or mineralogist) hammers faced with steel softened (or rather not hardened). Again, in another part of his progressive work, the steel hammer with which the engineer com-

* From the third lecture of the course of Cantor Lectures on "The Material, Construction, Form, and Principles of Tools and Contrivances used in Handicraft," by the Rev. Arthur Rigg, M.A.

* See Lord Derby's "Iliad," book 18, line 528, &c.

† The expression must be limited to the intensity of the blast, although it reads as if Homer was as familiar with "hot-blast" as we are; perhaps, he may have been.

‡ It would not have accorded with the acknowledged power of Vulcan to have represented him as needing the help of a sledge-hammer man.

menced his operations gives place to a bronze or copper one, and this is sometimes displaced by one of lead alloyed with tin, and the usual handle entirely discarded. It then assumes in all respects save material the form and mode of handling as described in the account of the prehistoric stone maul. This leaden cylinder, about 2 in. in diameter and 6 in. long, is the primary form of this second maul, which is about 3½ in. in diameter and 3 in. long, the ends being very much spread out. There is no handle to this tool; occasionally it is made of a mixture of lead and tin, in order to impart a hardness not possessed by lead alone. To strike where required the bright part, in the erecting of heavy machinery, the engine-fitter makes use of this contrivance.

The plumber dismisses all these, and for direct action upon the material employed in his trade he uses a hammer of wood, discarding not only the material, but also the form of hammers used in allied crafts. Indeed, one of his hammers serves a double purpose, for if at one moment it is a hammer, at the next it is used as a swage. In some cases, as in the working of copper vessels which have been silver-plated or gilt, the coats of the precious metals are so thin that, although the weight of a hammer-head is required, yet even the wooden hammer of the plumber, or the still softer leaden hammer of the engineer, is equally unsuitable, and therefore the workers in these metals cover the face of their hammers at times with one or more layers of cloth held on by a ring which slips round the ordinary hammer-head as the hoop on a child's drum. The covering of the hammer-head with cloth, to preserve the material on which the blow is struck, is not, however the only use made of a jacket over the hammer. For one purpose when a leather jacket is employed, even a leaden hammer might prove inconveniently noisy.

In a case brought before the Lambeth Police-court on the 19th of January, 1875, Edward Simpson, shoemaker, and others were charged with house-breaking. The implements used in this occupation were produced, and the newspaper report states that "one feature of the exhibition was a leaden hammer capped with leather, which it was stated was used for the purpose of driving wedges into safes, the leather causing the blows to be almost noiseless."

The veneering hammer, again, is compound, one end being formed of metal and the other of wood. This hammer is used, the one,—or metal,—end as a squeezing hammer (if such a term may be employed), the other as a tapping hammer, in order to ascertain by the sound produced where the veneer is adhering, and where it is not.

The stonemason seems to claim a universal choice, both of material and form. As to material, he has and frequently uses hammers made of wood, of iron (steel-faced), and of an alloy of lead.

In some cases the hammer and the anvil mutually change places, the hammer of wood, the anvil of metal, or the converse. Nor is the wood always of the same character. As varied as are the characters of the woods themselves, so varied are those chosen by different crafts for the employment of each craft. Even the varying density of the woods gives place more frequently than otherwise to lead, and we meet with metal hammers used on lead-covered anvils.

In the last journals of Dr. Livingstone, he mentions (page 89) that on one occasion he saw a bushwoman, in Cape Colony, using as a digging-hammer a round stone with a hole through it. Through the hole a rod was inserted. The end of the rod was used for digging, the weight of the stone assisting the muscular effort. He also states that these people prefer stone hammers and anvils because they do not burr up as iron ones do. In vol. i., page 146, there is a woodcut illustrative of the mode in which these stone-hammers and anvils are used. It differs materially from the plans supposed to have been adopted in the Stone Age. The hammer stone seems to be selected with careful reference to its shape, which approximates to that of a truncated cone. It is then bound round with the strong inner bark of a tree, and handles being formed of loops on opposite sides, the man, using both hands, raises the stone hammer above his head, and thus by muscular exertion, aided by gravity, he gives a blow of the requisite intensity. A heavy stone sunk in the ground forms the anvil. The bellows consist of two goat-skins, with sticks at the open ends, which are opened and shut at every blast.

On page 155 of the same journal, is the woodcut of a mallet used by the same people for separating and softening the fibres of bark by a process of tapping. The head of the mallet is often of ebony, with the face cut into small furrows, smaller, but similar to those used on our meat-hammers. There is what we may call a mallet (although differing in form from those we use) which was brought very many years ago from Otaheite. This also is cut on its four sides into small longitudinal furrows; each side is not an exact counterpart of the other. There is also the felted cloth made by the use of this mallet from the bark of trees. The mode of proceeding in the manufacture is identical in principle in the interior of modern Africa and in long past days in Otaheite.

THE PUBLIC HEALTH OF TOWNS.*

One of the grandest mistakes the public can fall into, is to consider that the work of sanitary reform, and the carrying out of all good sanitary measures and appliances, belong solely to corporations and sanitary inspectors acting under them. Every person can promote public health by attending to his own health; to the cleanliness of his own individual home, and working premises; and to the tidy condition of the accesses, courts, and grounds attached thereto. Co-operation is much valued by sanitary inspectors. Unfortunately, however, many do not co-operate and assist them who could, and who, from their social position and intelligence, ought to do so. And many again look upon them as a parcel of intruders,—impertinent and interfering fellows,—and set themselves to thwart them, and to evade statutory requirements, as far as they can. The want of co-operation of the kind alluded to may be accounted for in various ways: by the blindness of such persons to the dangers from unhealthy surroundings; by their fear of being led into expenses on account of improvements; by their firm determination not to be dictated to in the management of their own properties; or by, it may be, imprudent dealing at the hands of an inspector, or some of his staff. As sanitary improvements, however, are carried into effect, the beneficial results following thereon will do much to remove existing obstacles from the way. Education will also do more; and now that so great interest is being taken in schools by the public, and so much attention is being paid to them by school-boards and others, it would be well to have the pupils attending such schools taught the principles of health; and habits of cleanliness and respect for outward tidiness should be inculcated and impressed upon them with the view of promoting both present and future improvements on the sanitary condition of the people.

The sanitary officer will succeed best by exercising great care, neither to exact from people unreasonable nor needlessly expensive works, nor to cause them to make unnecessary alterations on their properties. And he should endeavour, as far as possible, to deal courteously with the public, and to carry them along with him. In this way he will strengthen his position, and gain the moral support of the community. Official work under the department of public health is rapidly developing itself, and new channels of operation are daily being opened up. This development is, in many places, ahead of the sanitary staff employed, and the consequences are, that the working staff is ofttimes overwhelmed by the magnitude and ramifications of the work to be overtaken and discouraged by more being expected of them, than they can really accomplish under the circumstances. But I am confident, when corporations come really to see the magnitude and difficult nature of this work, and consider fully its importance and urgency, and the chronic insanitary habits of a large section of the people, they will rival each other in their liberality to provide and support a sufficient staff of men, characterised by intelligence, activity, prudence, and common sense; and in giving them every encouragement amidst the dangerous and disagreeable duties they are called to perform. The duties of sanitary inspectors are neither pleasant nor safe; and it may truly be said of the most of those officers, that in the exercise of their important duties they carry their lives in their hands.

We cannot expect that all towns and populous places will be equally healthy, even under regulations and appliances of the highest sanitary order. There are other circumstances which will materially affect their condition of health, over which there may be no control; and, therefore, the death-rate alone cannot be taken as the gauge of sanitary efficiency. A man who has a bad constitution, and is far gone in consumption, would not likely prove a very promising patient for the physician. Just so, some towns and populous places have very bad constitutions. They stand on damp soils, are subjected to fogs, occupy low positions, are studded all over by manufactories, are overcast by smoke and deleterious gases from chimneys, have narrow irregular streets, and long narrow closes in near proximity, bounded by high dwellings in rickety condition, with low ceilings, badly lighted, and without means of ventilation, and are but partially and badly paved. Such towns are not easily dealt with. Much time is required to cope with what can be reached; and only, in many cases, with a new constitution in the shape of the demolition of the insalubrious parts, and the introduction of wide streets and new buildings having ample ventilation, can a moderate average rate of mortality be attained. But the death-rate is not on this account to be left out of calculation. I consider that, to have towns mapped out into small districts, and tabulated with the death-rate per month opposite each, information of the most valuable kind will be got, and the insanitary condition of special localities indicated, and the attention of sanitary inspectors called to them. In addition to this, it would also be of value to have a quantity of rainwater occasionally intercepted as it falls in each of the districts (at the same time), and subjected to analysis, in order to discover what impurities may be floating in the atmosphere; and whether the atmosphere of one part of the town is more impure and injurious to health than another, and how such has come to be the case. Such analysis would no doubt point to some causes, which might at least be modified, if not altogether removed.

The health of a town will be beneficially affected by wide streets; and it is therefore of the greatest importance, that corporations and police commissioners should have ample powers to regulate the widths, and to fix the directions and levels of every new street within their respective burghs,—nay more, I think it is essential that they should have powers to open up necessary leading thoroughfares, under fixed statutory powers, through open lands within their jurisdiction. Where a number of properties lie in the lines of such thoroughfares, it is highly probable that the owners thereof may not be of the same mind regarding these; and so, independently, each lays out new streets, or submits plans thereof, in the lines which he considers will bring him the best return; and thus, in many instances, streets are laid out which do not run into each other,—having no leading connexion,—and no proper sweep of ventilation. Now I hold that the interests of the owners of such grounds are not the only interests to be considered; these lands take their value from the town and their proximity to it; and the enhanced value of such lands may well afford proper lines of thoroughfare, and ample breathing spaces for the population which will in the course of time gather on them, and whose health will greatly depend thereon. It is also of sanitary importance to have all new streets laid out and sewered before building operations are allowed.

Even greater powers than do exist in Local and General Acts are still required to regulate, amongst other things, all classes of buildings, and the open spaces in rear of dwelling-houses. It is requisite that ample and well-defined powers should be granted to, and exercised by, those regulating such matters. According to present custom in most towns, all sorts of buildings are huddled together, side by side with dwelling-houses. Sometimes there are erected on either side of dwelling-houses, warehouses, workshops, manufactories, or other such premises, of much greater width and height; and leaving only small, confined, and ill-ventilated courts in rear of them, which cannot fail to be highly injurious to the health of the occupants. Now, in the laying out of new building-ground, the existing evils in the older parts of towns should be avoided. Therefore public works and workshops ought to be, to a very great extent, if not altogether, grouped in various districts; and shops and dwelling-houses in others. Such an arrangement would greatly improve the health and comfort of the people.

The heights of all buildings should generally

* From a paper by Mr. William Mackison, C.E., Burgh Surveyor, &c., Dundee, read before the Sanitary Inspectors' Association for Scotland, at the first annual meeting.

be regulated by the widths of the streets on which they abut. And I think it most desirable that dwelling-houses should not be of a greater height to the eaves than four-fifths of the width of any new street; nor warehouses and manufactories higher than the full width, where dwelling-houses are built on the opposite side. Where, however, the latter class of buildings are erected on both sides of a street, the height of such buildings might be somewhat greater. But minimum widths should be fixed for both classes of streets, so as to secure proper ventilation and thoroughfare. The chimney-stalks of all public works should be built sufficiently high, to carry the smoke and bad gases emitted therefrom over the tops of the dwelling-houses; and every effort should be put forth by sanitary inspectors to have all furnaces fitted up with the best appliances for consuming their own smoke.

The healthy condition of dwelling-houses will to a large extent be determined by the widths of the open spaces left in their rear, and the manner in which these are occupied and kept. Where ground is to be laid out for feuing purposes, and where building sites are sufficient to admit of minimum open spaces in rear of proposed dwelling-houses, co-extensive therewith, and at least equal in depth to the widths of the streets on which they will abut, such open spaces should be required. And Boards exercising jurisdiction over the erection of dwelling-houses should have power to insist on ample open spaces being provided in rear of such buildings. Each of these open spaces might, with advantage, be divided into two parts: the one, say one-fourth of the width next to the houses, to be formed into a paved court, for the benefit of the children, and the other, or remaining three-fourths, to be laid out as a washing-green, or for garden purposes, as circumstances might require, and having the washing-houses and coal-cellars built along the side-walls, and the ashpit and other necessary conveniences suitably placed and screened at the back wall, with paved walks thereto. Where grass will not grow on the spaces for washing-greens, and where these are not or cannot be kept in good condition, such spaces should be paved, or covered over with asphalte. Again, where the business requirements of the town render the addition of saloons to shops necessary, these might, in certain circumstances, be allowed to be built to the height of one story, with flat roofs, over portions of the back courts, on condition of the areas of the paved courts thereby affected being extended backwards in equal proportions to the spaces thus taken off them. This system of feuing would, as a matter of course, spread the town over a larger area; would promote the healthy condition of the people; would benefit the feuars; and would also allow the superiors a fair value for their lands.

The ventilation of all single-room dwellings should be insisted upon, and ample provision made for admitting the fresh air free of draughts, and for carrying off the vitiated air. In such dwellings—which are in most cases very unsatisfactory in their conditions—many persons are couped up in the most indecent manner. Such rooms should be large, and have each a space sufficient for a bed and for dressing purposes, partitioned off by a movable screen of the height of 7 ft. or so, to afford privacy, and promote common decency. The promoting of morality will always advance the good sanitary condition of the people. If the houses of the working men with families consisted of three rooms instead of two, and these were rightly used by them, it would greatly tend to promote the physical and moral well-being of those families.

I have no doubt that the great mortality amongst children is partly caused by their being often exposed to cold draughts in houses, and left sleeping in rooms with damp floors and open doors and windows. Provision to render it imperative on all persons building new dwelling-houses to have them officially examined and duly certified as fit for habitation before occupancy is most desirable and necessary.

UNDERPAID SURVEYORS.

Sir,—As your correspondent "L. L." is often surprised at the low salaries paid to town surveyors, I beg to send you an advertisement, taken from the *Bristol Mercury*, of the Radstock Local Board requiring a surveyor and sanitary inspector, who must devote the whole of his time to the duties of the office, and be acquainted with road-making, sanitary work, and accounts, at a salary of 60*l.* per annum. I may state that the person who was elected is the son of a grocer and draper living in the place. Can any one be surprised at the *unsanitary* state of some of our towns and villages?

Surveyor.

PUBLIC IMPROVEMENTS AT NEW MAROKE.

Of the numerous mining villages springing up in Cleveland few are improving more rapidly, and making greater provision for the social and spiritual wants of the inhabitants, than that of New Maroke. The village is in close proximity to the Upleatham mines of Messrs. J. W. Pease & Co., and, though of very recent growth, it has already a population of 1,600 inhabitants. A little church, the gift of the Earl of Zetland, has just been completed, and will shortly be consecrated; and the Primitive Methodists, who form a rather strong body at the place, are building a commodious chapel, which is expected to be finished in the early part of next month. Through the liberality of Messrs. J. W. Pease & Co., the village will also possess ere long a literary institute. The new building, which will cost something like 2,000*l.*, has already been commenced by the contractor, and will contain library, reading-room, lecture-hall, recreation-room, and ante-room. The lecture-hall will be 42 ft. by 9 ft., and 29 ft. wide, and the gallery 29 ft. by 22 ft. The reading and other rooms will be large and spacious, and afford every comfort for the members. A neat cottage for the attendant will adjoin the institute. The architect for the building is Mr. Carrington, of Maroke. Mr. E. Yockney is the contractor for the mason work; and W. Harrison, Guisborough, for painting and glazing.

SANITATION OF HOUSES.

At the recent meeting of the British Medical Association in Edinburgh, Mr. W. Eassie, C.E., of London, read a paper "On the Sanitation of Houses, especially with Reference to Drainage." He said:—The evils of improper drainage are best observed in houses that have been from time to time added to until the cottage has become almost a mansion. One is then able to trace the first awakening up of the inmates, when the patrimonial cesspool has filled up and choked the drains. When this happened in villages, all that was done was merely to partially empty the receptacles and clean out the drains. And when this had occurred several times, and the sides caved in, a new dumb-well was sunk, and the drains led into it, the old pit being covered up with a stone. It was cheaper to do this than to fill it up; and, besides, this procedure did not necessitate the absence of the family. It was the same in towns, and only a week ago I laid bare in a West-end London house three cesspools which had been dug in most brotherly proximity, and abandoned in rotation as they filled up with ordure and filth. Four cartloads of nightsoil were removed, which could not have seen daylight for half a century. Nor would it now, had not the rats formed runs in their vicinity, and allowed horrible smells to invade the house by way of a long-forgotten back drain. The reason why these ancient nuisances are found inside houses in towns and cities was not because they could not be accommodated outside the house, but because the slops from the kitchen and bath and laundry wastes were insufficient to flush the more solid wastes outside the walls. In nearly every case, too, the drains were of brick, laid with uneven bed, and through the joints of which the fluids percolated. We will take an instance. A cottage is drained into a cesspool in the kitchen, and when that is full another is dug, until the place is honeycombed with them, the subsoil saturated, and the well poisoned. A common privy is used in the yard, and this performs the same evil functions. By-and-by waterclosets are introduced and earthenware pipes, and the cesspool for these is now dug down in the garden, with a lower one for an overflow, and both cemented down airtight fashion. There is no ventilation either, except through the trapping water of the syphons at the foot of sink waste, soil-pipe, or rain-water stack. And here I may say that the drainage into a cesspool is not necessarily dangerous, provided only that the waste-pipes of the sinks deliver outside over a trap; provided too, that the soil-pipes are carried roof high, and a foul-air withdrawing cowl fixed upon them all would be well. It might, in some cases, be absolutely necessary also to ventilate the cesspool by an upright shaft, or a ventilating charcoal trap in the stone cover, and it might even be wise occasionally to ventilate the march of the drain. Where a common privy is used, an earth or ash-closet ought to replace it. The next difficulty arises where a parish sewer is put in the main road, and the value of the land enhanced so much as to make it worth while to add an extra wing or two, to convert the old stables into servants' offices, and to erect new stable accommodation. When this has happened, sometimes the one-half of the house is drained into the sewer and the other half into the old cesspools. The old cesspools have not, however, been dug up in the basement of the house, neither the urine catch-pit in the stables. The result of this is not difficult to imagine. Even should the whole of the cottage chrysalis, but now winged, mansion be drained into the new sewer, it is just possible that the drains are laid without fall, or with backward fall; syphons put in where they ought not to have been; rectangular bends instead of acute ones; and a ventilating shaft not only forgotten, but the sinks, baths, and lavatories taken direct into the drains: and the result, if not disastrous in the matter of health to the inmates, has proved sufficiently annoying to compel the dismissal of the builder and the attendance of the engineer. It is very easy to so arrange the plan of a house that the whole of the wastes shall deliver immediately outside the house, and to have nothing but the outside wall between the water-closets, lavatories, and sinks. When it is found advisable to drain the basement, it can be disconnected from the main drain so to speak by interposing over the junction a ventilating shaft. The sinks and lavatories should all deliver over an open chamber. For the rest the walls of the house should be built hollow, and protected from *rising* damp also by a proper damp-proof course.

REDCAR RACE-GROUND.

Considerable improvements have been made on the race-course at Redcar. The old wooden stand has given way to ranges of permanent buildings. Two lofty brick and iron stands have been erected, which together will accommodate over 5,000 persons. The architect for these erections is Mr. Adams, of Stockton-on-Tees. The large stand for the general public, in design, is similar to that at the Alexandra Palace race-ground. The steps for the accommodation of the spectators spring from a low terrace, rising only a few feet from the ground, and they are continued upwards to a great height, giving accommodation for a dense body of people. They are surmounted by a balcony, intended for the press and trainers, and to which entrance is obtained by a staircase from the weighing-room. The stand is placed at such an angle with the course that from any portion of it the entire circuit of the course can be seen. The whole building is substantially erected, and we believe that the cost is under 3,000*l.* The new stewards' stand is a two-storied erection, with ornamental balconies and with spacious retiring-rooms in the basement. The enclosure is spacious and capable of accommodating a large assemblage.

DECORATION OF ST. GEORGE'S HALL, LIVERPOOL.

The interior of St. George's Hall has been re-decorated by Messrs. Alexander White & Sons, of that town, under the superintendence of Mr. Thomas Shelmerdine, jun., the Corporation surveyor. The length of the large concert-hall is 170 ft., the width on the ground-floor 77 ft., and the width on the gallery floor from wall to wall 100 ft. The height of the ground-floor to the crown of the arch is 95 ft. Messrs. White's estimate for decorating the large and the small concert-rooms, including all extras, is 3,745*l.*, and they have carried out the work in a manner to satisfy the Corporation. They were, however, rather hampered in their progress by a strike of labourers, which delayed the erection of the scaffolding for upwards of a fortnight. At length that part of the work was proceeded with, the scaffolding being erected in three sections, commencing at the north end of the hall. There are fifteen large panels emblazoned with various coats of arms, the principal one being the Royal arms in the central crown of the arch. Next are the Liverpool arms in various panels, those of the House of Lancaster, St. George and the Dragon, and the arms of the Prince of Wales. All the armorial bearings, which are in relief, have been emblazoned in heraldic colours. The chandeliers in the great hall have been re-burnished and re-fixed. It was impossible to introduce more window-light without interfering with

the exterior of the hall; but, after consideration, it was deemed desirable to take out the small diamond patterns of glass which had originally been introduced in the windows, and which interfered considerably with the light. This has been done, and large plate-glass windows, set in oak sashes, have been put in, and now when the visitor enters he finds that there is nothing sombre or gloomy in the aspect.

COMPETITIONS.

Brighton School of Art and Science.—Mr. J. S. Gibbons, of the firm of Goulty & Gibbons, of London and Brighton, architects, is the author of the first premiated design for the proposed new building to be erected for this institution in the Grand Parade; Mr. J. Toner, of London, taking the second award. Ten designs were submitted in competition. The limit of the amount within which the architects were confined was 4,200*l.*

Bridgend Schools.—Sixteen designs were submitted in competition for the new buildings for the Bridgend School Board, which was to accommodate 300 children, with a master's residence. Several designs were rejected at an early stage, and finally the designs marked "Y. Y.," and "A Midsummer Night's Dream," were awarded the first and second premiums. The author of "Y. Y.," who is to be entrusted with the execution of the work, is Mr. Henry C. Harris, of Cardiff and Cooper's Hill, Staines; "A Midsummer Night's Dream" being the work of Messrs. Haddon, Brothers, of Hereford and Malvern. Among the local competitors, Messrs. James, Seward, and Thomas, of Cardiff, submitted three designs; and Messrs. Wilson & Willcox, of Bath, two. The design, "To be or not to be," we believe by Mr. W. D. Blessley, of Cardiff, was placed third.

LONDON SCHOOL BOARD SCHOOLS.

Stoke Newington.—A new school was opened on the 10th instant, in the Gainsborough-road, close to Victoria Park, and overlooking Hackney Downs. The building consists of three stories, with ample playgrounds, and a separate building forming the caretaker's house. The ground-floor, in which are placed the infants, has a large schoolroom and two class-rooms with recesses, lighted from above, for galleries. The girls on the first, and boys in the second floors, have a like accommodation (except the recesses), with ample cloak-rooms and lavatories approached from their respective staircases. There are also rooms for the master and mistress. The style of architecture employed is that of Queen Anne, the architect being Mr. E. R. Robson, and the contractor Mr. Ennor, of Commercial-road; Mr. Ellson was the clerk of works. The school will hold 730 children at a total cost, including purchase of ground and other expenses, of 10*l.* 11s. 5d. per head. The amount of the contract was 5,930*l.*

Lambeth.—On the 13th inst., Mr. E. H. Currie, vice-chairman of the Board, presided at the opening of a new school in Walnut Tree-walk. In the course of a long address, he said that the school was, perhaps, the most peculiar one in its way that the Board had built in London, because it was intended exclusively for girls and infants. The building in which they had met would accommodate 779 children,—namely, 235 girls and 544 infants. Notwithstanding the present accommodation, there were nearly 1,000 children who were deprived of means of proper education. At present the Board had accepted contracts for the erection of 135 schools to accommodate something like 110,000 children.

THE BAINBRIDGE MEMORIAL CHAPEL, BYKER, NEWCASTLE-UPON-TYNE.

The Wesleyan chapel, which has been erected at Byker, as a memorial of the late Mr. Cuthbert Bainbridge, was opened on Tuesday, the 10th inst. Some time ago the Wesleyan Methodists of the Newcastle district resolved to remove from their old place of worship at St. Lawrence, and to open out a mission chapel at Byker, with the view of ultimately erecting a new place of worship there. The building opened to the public comprises, on the ground floor, a chapel, designed to accommodate about 320 persons, approached from the turnpike road by a double flight of stone steps, and having an inner porch, a vestry for the minister, with w.c. and lavatory, and staircase leading to the floor below. The schools are arranged upon the basement floor, with an entrance from Edwin-street, and, with the classrooms, will give accommodation to about 400 scholars. A spacious area has been formed round the building to give light and ventilation to this portion of the building. The warming will be effected by means of a hot-water apparatus placed in the boiler-house in the sub-basement. The building has been designed in the Gothic style of the thirteenth century. Messrs. N. & R. Reed have carried out the works in the most substantial and satisfactory manner as sole contractors, employing as sub-contractors, Messrs. R. B. Charlton & Co. for the plumbing and gas-fitting; Mr. Beck for the slating; and Mr. J. Messenger for the painting and glazing. The cost of the building has been 2,920*l.*; and it is satisfactory to add that there are no extras over the contract amount. The total cost, including price of land, building, architect's fees, and other items, will be about 3,700*l.* Mr. Thomas Oliver was the architect.

HORTICULTURE AT THE INTERNATIONAL EXHIBITION, PHILADELPHIA.

Mr. Cunliffe Owen, C.B., the British Executive Commissioner, is making known to foreign intending exhibitors in the Horticultural Department what will be best appreciated there, and those concerned should obtain the circular.

Besides plants, *Adornments of Horticulture* are asked for,—Garden statuary, fountains, vases, pedestals, summer-houses, and window gardening as applied to dwellings. *Garden Requisites*,—such as horticultural buildings, propagating-houses, hot-beds, &c.: the best mode of heating them; and as to *Art and Science of Horticulture*,—Designs for laying out gardens and the improvement of private residences; designs of rustic constructions and adornments for private and public grounds, public squares, parks, &c., showing arrangement of commercial gardens or nurseries, and for the parterre; examples of planting and the ornamental grouping of trees, plants, and shrubs; and the treatment of water for ornamental purposes.

BRIDPORT SCHOOL OF ART.

The exhibition of the works of the students and the annual meeting took place in the Town Hall on the 13th inst. The works were inspected by a large number of visitors. In the course of the proceedings the Rev. R. L. Carpenter (secretary) read the report of the committee, in which they say "They have now to record a further advance. In the local examinations, in April, 36 students were successful, whilst 26 was the highest ever reached before; 543 works were sent up for inspection to South Kensington, while, till last year, 200 was the average; on these 21 industrial students earned grants, and 16 students were awarded prizes, while the works of eight students were selected for national competition. Two ladies in former years have obtained the national book prizes; but this year, for the first time, medals have been gained—a silver medal by Mr. J. H. Dunham, and a bronze medal by Mr. F. H. Newbery; both these students are making art their profession."

CASES UNDER METROPOLITAN BUILDING ACT.

Surveyors' Fees.—Noah Moss, of 6, Montague-road, Victoria Park, was summoned by Mr. John Turner, one of the district surveyors of Islington, as being the builder or workman engaged for erecting or doing certain work to a house on the west side of Alson-road, Islington.

Mr. Turner said he had found the defendant on the building at work as a carpenter, and when he asked him who was the builder he said he did not know, but he could point him out to him. The contractor should have given him two days' notice of his intention to build before the building was commenced, but that was not done. The defendant was summoned, as he could not find out the master's name. The Act provided that the master builder, or any person who executed any part of the building, might be summoned. The defendant was very civil to him, and he had reason to believe that he was only the workman, and not the builder.

The defendant, said, in reply to the charge, that he was not the master builder, and was only employed on the building as a journeyman.

Mr. Barstow fined the defendant 10s. and 2s. costs, or in default ordered him to be imprisoned for ten days.

The defendant, who said he had no money, was removed in custody.

CHURCH-BUILDING NEWS.

Gloucester.—In consequence of many complaints respecting the defective state of the roof and the ventilation of St. Mary De Crypt Church, it has been determined to remedy these defects. This work is to be carried out under the direction of Mr. Waller. Further restoration being desirable, a committee has been appointed to consider the additional work suggested by Mr. Waller. His chief recommendations are thus summarised:—(1.) Restoration of the roof and improvement of the ventilation; (2.) Thorough cleansing of the interior walls, including the pointing of the old stone work; (3.) A new system of lighting the whole church by means of lines of gas jets in the chancel and coronæ of light round the pillars of the nave; (4.) Additional improvements and repairs in the chancel and other parts of the church. To effect the restoration between 500*l.* and 700*l.* are required. Mr. Waller also recommends that the whole of the church be well cleaned, and that the white and yellow wash be carefully taken off the dressed stonework, defective stones, of which he believes there are but few, being reinstated, and the joints of the stonework pointed; and also the removal of the western gallery.

Awbridge (near Romsey).—The memorial stone of a new church, to be named All Saints', has been laid by the Rev. T. H. Tragett, of Awbridge Danes, who gave the ground. The site of the church is on the borders of the grounds of Awbridge Danes, in the parish of Michelmersh. The design is treated in the Decorated style of Gothic architecture. It consists of a nave, chancel, vestry, porch, and vault under the vestry for the warming apparatus. The nave is 58 ft. in length, by 21 ft. 9 in. in width, and is arranged to accommodate 145 adults and forty-two children. The chancel is 23 ft. by 20 ft., with choir-sittings for sixteen. In all the church contains sittings for 203 worshippers. The exterior of the building is faced with Swanage stone, with Bath stone dressings. All the roofs are open-timbered trussed rafter roofs, covered with tiles. An oak bell-turret, with a shingle spire, on the west of the nave-roof, will carry three bells. The church has been designed by, and its erection will be carried out under the superintendence of, Mr. John Colson, of Winchester, architect, and the contract has been taken by Mr. John Crook, of Northam, Southampton, at 2,250*l.* The clerk of the works is Mr. John Williams, of London.

Preston.—St. Saviour's Church has been reopened after cleaning, completing, and erecting a reredos. The reredos is from the designs of Messrs. Myres, Veevers, & Myres, of Preston. It is executed in Caen stone, and divided into three bays, each with enriched centre panels, the centre one being surmounted by a crocketed gable and a moulded arch, supported upon a triple cluster of columns, the outer columns being of green polished marble, each having a foliated cap and moulded base. The reredos is surmounted by a perforated and foliated cresting. On each side the space to the level of the east window is covered with Maw & Co.'s majolica tiles in patterns. The work of the reredos has been carried out by Mr. H. T. Miles, of Preston, from the architects' drawings, and under the supervision of Mr. T. H. Myres. The south chancel window has been enlarged. The decorations have been carried out under the architects' supervision by Messrs. R. E. Lucas & Co., Preston. On each side of the tower doorway is a cluster of caps, carved with natural and conventional foliage by Mr. H. T. Miles. The heating apparatus has been enlarged. Exclusive of the reredos, 112*l.* have been expended.

Rogate.—The parish church, which during the last sixteen months has been rebuilt, with slight exceptions, has been re-opened. The old church was built in 1160, and one of the arches of the original structure is still left standing. It is said to be a fine specimen of Norman architecture. During the progress of the work, some interesting relics were discovered, amongst them a stone cross of the fourteenth century, and one previously to that date. The latter has been worked into the south wall beneath the tower. The architect was Mr. Penford, of Westminster; the builders were Messrs. Lewis, of Westmeon; the clerk of works was Mr. Charles Bridger, Haslemere; and the foreman of works, Mr. W. Bridger. Some of the work has been entrusted to local tradesmen; the windows, with the exception of the east, to Mr. Othen, of Midhurst. The hot-water apparatus is by Mr. Toop, of Rogate.

Christleton.—The parish church at Christleton, which is now in a very dilapidated state, is shortly to undergo considerable improvement. Its exterior defects are hidden by a mantle of ivy, which gives to the church a rustic and venerable appearance. In the inside the pews are so narrow that to sit in them with comfort is difficult. There is a fine arch in the east wall of the tower, which some church restorer of the past has blocked up with an ugly gallery, shutting out the west window. As so many alterations were suggested, it was decided to consult an architect, who advised the parishioners to entirely rebuild the body of the church, but to preserve the tower—which is in a tolerably good state of preservation, having been built in the sixteenth century. The following tenders have been received for the restoration, according to drawings supplied by Mr. Butterfield, the architect:—

Cooke & Moulton	£8,278 0 0
Wood	7,770 0 0
Readdie	7,749 0 0
Thompson	7,345 0 0
Roberts	6,991 0 0
Holland	5,489 0 0

Since added for tower, 577*l.* Lowest estimate, 6,066*l.*

Eccles.—The ancient parish church of St. Mary, which has been closed for three months for internal repairs, has been opened by Earl Mulgrave. The whole of the plaster and whitewash has been removed, and the red sandstone walls were cleaned and repointed. The modern walls have been tooled and pointed. New oak screens have been placed on each side of the chancel. The pulpit has been lowered and provided with new oak steps. The gas-brackets and communion standards have been burnished and decorated, a new stone chancel-arch has been introduced; oak wall-boarding, shoulder-high, has been carried round all walls where they abut against the seats; and the ancient monument in the Ellesmere Chapel has been cleaned and painted in heraldic colours. The east wall of the chancel has been decorated by Hardman, of London, from designs furnished by the architects, Messrs. Maxwell & Tuke, of Bury, under whose guidance all the works have been conducted.

HEIGHT OF ROOMS.

Sir,—A paragraph at the foot of p. 686 of the *Builder*, headed "Houses unfit for Habitation," in which the height of the rooms of the houses referred to is stated to be only 6 ft., leads me to suppose that it may not be generally known that local authorities have not, legally speaking, any power over the height of rooms in new buildings. Hitherto, as you are aware, it has been customary to include in every series of building by-laws, a clause regulating the height of rooms intended for habitation; but such a by-law is no longer allowed by the Local Government Board, as, on legal authority, it is declared to be *ultra vires*, the height of a room having, as is alleged, nothing to do with ventilation. I could instance many cases in which such a by-law, having been proposed by local authorities, has been struck out by the Local Government Board, and the endeavours of those who know the value of the regulation to get a special clause inserted in the new Sanitary Act have failed. A Surveyor.

RECOVERY OF COMMISSION FOR SALE.

THORNHILL *v.* CARTER.

This was an action, before Mr. Justice Brett and a common jury, by an estate agent to recover the sum of 500*l.* as commission on the purchase of an estate. The plaintiff had offered the defendant (a retired officer in the army) an estate in Buckinghamshire on his signing a "bonus-note," as it is called, in these terms:—"That, provided he purchased the estate, he would pay, by way of bonus, the sum of 500*l.*" The plaintiff then gave the defendant information of the estate, which the defendant afterwards purchased, and the plaintiff then claimed the 500*l.*, which the defendant declined to pay, on the ground that he had, on the first negotiation with the plaintiff, declined to purchase, and had afterwards entered into direct negotiations with the owner, whose agent the plaintiff was not.

Mr. Murphy, Q.C., and Mr. Lumley Smith were for the plaintiff; Mr. De Michele was for the defendant.

The defence set up was that the contract was when the defendant declined to purchase put an end to before the estate was bought by the defendant for 19,000*l.*; but

The Judge told the jury that there was no defence, as there was no revocation of the contract by mutual consent.

Accordingly, the verdict was entered for the plaintiff for 500*l.*

The Future Management of the Institute of Architects.—The committee appointed to inquire as to this have now completed their report. We understand that they are not unanimous.

THE POPULATION OF TYNDALL'S BUILDINGS.

Sir,—My attention has been directed to a paragraph in your last number, in which objection is taken to the accuracy of the number of persons returned as living in Tyndall's-buildings, Gray's-inn-lane, given in the schedule forming part of my report on the application of the Artisans' Dwellings Act to this portion of the metropolis.

I have to inform you that the Metropolitan Board of Works, who, as the Local Authority, are charged with the execution of the Act, are at this moment engaged in taking the numbers of those living in this and the other courts and alleys affected by my improvement scheme; and that, in due course, the result of their labours in this particular will be made public.

I have no wish to anticipate the return now being made by the local authority, but would simply remark that it will be valueless, unless the numbers are taken late at night (certainly not earlier than the closing of the publichouses), until which time the habitations proposed to be removed under the provisions of the Act do not receive their full complement of occupants.

A considerable per-centage must also be added to the total arrived at, owing to the exodus which takes place at this season of the year for harvesting, the majority of those who leave London for this purpose also assisting at hop-picking. It is well known that large numbers of men, women, and children, migrate from Gray's-inn-lane into Kent and Surrey, at this time, with the object I have stated.

Meanwhile if Lord Shaftesbury and Mr. Payne would like to learn how some of the rooms in Tyndall's-buildings are occupied, let them visit the ground-floor of No. 1, where they will find the following persons living in one apartment:—

John O'Donnell, aged 43.
Hannah O'Donnell, aged 40.
John O'Donnell, aged 18.
Patrick O'Donnell, aged 15.
Jeremiah O'Donnell, aged 14.
Daniel O'Donnell, aged 13.
Honora O'Donnell, aged 7.
Margaret O'Donnell, aged 4; and
An infant 6 weeks old.

I am not ungenerous enough to say that this is to be taken as a sample of the whole, nor would I attempt to deduce from this example the moral *ex uno disce omnes*.

But that there is an amount of overcrowding even in Tyndall's-buildings, of which the president and secretary of the Society for Improving the Dwellings of the Labouring Classes little dream, I am as certain as that it exists to a still greater extent in the courts and alleys by which it is surrounded. Lewis H. Isaacs.

Miscellanea.

St. Thomas's School-Chapel, Flint Common.—The opening of St. Thomas's School-Chapel, the foundation-stone of which was laid on Whit Tuesday, 1874, took place on the 4th inst., and the ceremony was very imposing throughout. The morning service was attended by a large congregation from the parish of Flint and surrounding parishes. The building consists of a nave, chancel, vestry, and north and south porches, affording accommodation for 300 worshippers, and 230 children when the edifice is used as a school. Being built of local stone, with buttresses, the appearance is substantial. The style is Early English. The chancel is separated from the nave by a wall of unpolished Halkyn marble, having a coping and plinth of the same material, but polished. The chancel gates are of wrought-iron and polished brass; the lectern is of polished brass. There is a stained glass window in the east end, set up in memory of James Eyton, some time town clerk of Flint, and Mary, his wife, and of Sophia Eyton, late of Cornist. The architect, Mr. John Hill, of London, was presented with an épergne, in recognition of his services as architect.

Lillie Bridge Skating Rink Club.—A new club has been formed under this title, the Duke of Montrose being the chairman of the committee. The club has taken premises next to the polo ground at Lillie Bridge, and has already erected a large tent for the accommodation of the skaters belonging to the club. The committee are now arranging for the erection of a permanent building, with club premises in front, which we are told is to be built after the style of a Swiss chalet. Mr. Walter Emden is the architect employed.

The Sussex Archæological Society.—The annual meeting of the Sussex Archæological Society was held at Lewes last week. One of the chief points of interest was a loan museum arranged in the county hall, in which there was a collection of tapestry, formerly the property of the Duke of Newcastle, and presented to the Society some years since by Lord Chichester. A collection of Celtic, Roman, and other coins, collected in the county, was also on view as well as several valuable books, manuscripts, and relics, among them being the ancient staves of office used by the high constables and head boroughs of Lewes. The places visited included Lewes Castle, built by William de Warrenne, several churches in the town containing ancient monuments, as well as other buildings, and, of course, Southover Church, with the Gundrada Chapel, containing the remains of William de Warrenne and Gundrada, his wife, all well-trodden ground offering no hopes of novelty. The dinner was held in a large tent erected in the Priory grounds, which was a point of considerable interest, as being the site of the ancient and extensive priory of St. Pancras. The dinner was presided over by Mr. J. G. Dobson, M.P.

The Hermann Monument.—The Hermann Monument, near Detmold, was inaugurated in the presence of 40,000 people. Her von Bandel is the sculptor. The *Times* correspondent says,—The statue is described as an imposing work of art; 80 ft. high from the point of the uplifted sword to the legionary eagle trodden under foot by the victor. This gigantic Hermann in form and countenance is intended to impersonate the frankness and strength attributed to the ancient Germans by their Roman enemies. His costume, being the old Saxon tunic, with bear-skin mantle and helmet, leaves arms and legs uncovered, and gives full effect to the huge proportions of this the tallest figure erected since the Rhodian Colossus. The circular cupola temple, which forms the pedestal, is 89 ft. high, and is supported by a foundation 66 ft. in diameter. The figure, being of chased copper, derives solidity from a complicated system of iron tubes placed in the centre of the body. The copper used in making the statue weighs 237 cwt., the iron, 1,133 cwt. A national reward has been conferred upon Herr von Bandel.

Fatal Accident at Bishop Auckland.—The new building which is in course of erection in Newgate and Victoria streets, Bishop Auckland, for Mr. George Moore, and which is intended for a large commercial hotel, was on the 13th inst. the scene of a fatal accident. A large number of men are employed on the work, and the building is nearly ready for the roof. Three young men, named Watson, Patterson, and Durkin, were engaged above the second floor on a scaffold, building up a chimney-breast. They were attended to by a man named James Brown. By some means unknown the wall below them gave way, letting out the joists, when the scaffold fell, and the men, together with the scaffold and about 15 ft. of the wall, were precipitated into the cellar, a distance of nearly 30 ft. The fallen *débris* had smashed out nearly every joist in both floors. Brown was killed and the other three men sustained serious injuries.

The Pease Statue at Darlington.—The bronze statue to be erected in Darlington to the memory of Joseph Pease was successfully cast, on the 14th inst., at Messrs. Cox & Son's foundry, Thames Ditton. The statue is to be placed in a conspicuous part of Mr. Pease's native town, Darlington, the birthplace of the railways of the world. The unveiling will take place on the fiftieth anniversary of the running of the first passenger train, the 27th of September next, on which day the "Railway Jubilee" is to be celebrated at Darlington. The statue itself will be erected on a pedestal 9 ft. high, of finest axed granite, having four bronze panels at the sides delineating the various phases in Mr. Pease's eventful career,—1, emancipation; 2, education; 3, his political and Parliamentary career; and 4, mining and railways. The work will cost about 3,000*l.*

Savile Park Building Club, Halifax.—A scheme is on foot for the erection of a large number of dwelling-houses, of various sizes, near to Savile Park. The buildings are proposed to be erected on the club principle, of a certain deposit down, and the remainder by instalments. The first lot are to be nine semi-detached residences, each of the value, with the land, of 1,000*l.*, on the west side of Savile Park-road. The architect is Mr. J. W. Gough.

Pollution of the River Lea.—A Government court of inquiry has just been held at the Local Board offices, at Tottenham, by Col. H. Ponsonby Cox, into a complaint made by the Lea Conservancy Board to the Secretary of State, that the Tottenham Local Board were not carrying their sewage works in compliance with the provisions of the 51st section of the Lea Conservancy Act. The Local Board had provided additional depositing tanks, but made no attempt to filter. There were more than twenty-four places which had sewage outlets into the Lea above Tottenham; fifteen of them using no disinfectant process, three using the lime process, and four irrigating. Mr. Pead, for the Conservancy Board, said his Board declined to recognise any process in particular. The Commissioner said it was requisite that samples should be taken from time to time, and therefore some time must elapse before he could make his official report and decision.

Self-acting Cinder-sifting Ash Closets.—We are glad to find that these closets, made under Morrell's patent, are employed largely for use on ground-floors and yards at gentlemen's houses, and at workmen's cottages in villages. For mills, schools, and institutions in special localities they may be recommended. The principle of the dry-ash closets, the invention of Mr. Conyers Morrell, C.E., consists, our readers may remember, in the utilisation of the house-ashes as a deodoriser. This object is attained by an ingenious but very simple contrivance. The ashes are thrown on a sloping-screener, at the rear of the seat. By an arrangement of levers this screener is moved every time the seat is occupied, and the ash-dust is separated from the cinders, and falls into a receptacle from which it is meted out in the exact quantity required when the seat is vacated. The cinders pass off the screener, and may be again used as fuel.

Sewage Deposits in the Thames.—An elaborate report has recently been issued by Sir Joseph Bazalgette, the engineer to the Metropolitan Board of Works, in reply to a communication addressed to that Board by the Thames Conservancy, alleging that the accumulation of deposit on the river bank opposite Crossness outlet, between 1870 and 1874, amounted to 240,000 cubic yards, equivalent to a depth of between 7 in. and 8 in. spread equally over the bed for three-quarters of a mile. Sir Joseph Bazalgette, while admitting the statement, adds that the increase of deposit is not uniform nor permanent, and the amount of deposit was less by 313,000 cubic yards in 1874 than it was in 1872, showing a natural deepening of the river equivalent to 10 in. between 1872 and 1874. He adds that the evidence goes to show that the sewage discharged into the river at Crossness tends to scour it rather than to form deposit.

The Clock at Holy Rood Church, Southampton.—This clock is now on the point of completion. It has been supplied by Mr. J. Blount Thomas, of the High-street. The dials, fixed in stone rims, weighing about three tons each, are 5 ft. 4 in. in diameter, of solid copper, and weigh each about a hundredweight. The two faces, one in the front of the tower facing the High-street, and the other on the front looking towards Bridge-street, are specially made of opaque glass, the centre being in one piece, and not like most illuminated clocks having four lines from centre to circumference, which at a distance are not unfrequently confounded with the hands. The lighting is on a self-acting principle, turning on and off the gas as required, and is accomplished by six copper lamps, with glasses and reflectors to utilise the rays. Most of the work has been done in the town, by Messrs. Lankester, Buchan, & Thomas; the masonry being by Mr. Bostock.

The New Schools for Darlington.—A meeting of the governors of the Darlington Grammar School was held on Monday, at the School Board offices, Northgate, Mr. David Dale presiding. The plans of the proposed new schools were submitted to the meeting by Mr. Hoskins, architect. It was stated that Mr. Hawkins, the architect of the Charity Commissioners, did not approve of the proposed large hall, which he thought was more a luxury than a necessity. He also objected to the proposed sleeping accommodation. It was stated that the building would cost about 14,000*l.*, of which only 10,000*l.* were subscribed, exclusive of scholarship subscriptions. After some discussion, it was decided to send the plans back to the Charity Commissioners, to secure the approval of the alterations made.

Mr. Bateman's Proposals for Improving the Ipswich Dock and Navigation.—With respect to the works necessary for improving the dock entrance and the navigation of the river, the Dock Improvement Committee rely upon Mr. Bateman's report and estimates. His minimum estimate includes 40,000*l.* for new lock, with entrance-gates; 16,000*l.* for one dredger, with two hopper-barges; 3,000*l.* for dredging in the lower end of the present dock; 20,000*l.* for dredging in the channel; altogether, including 8,000*l.* for a portion of contingencies, amounting to the total sum of 87,000*l.* But this does not include provision for unloading large vessels at the present merchants' quays, nor for deepening the upper end of the dock, nor for a pair of intermediate gates, to divide the new lock into two; neither does it appear to include the timber jetty, for protecting the entrance to the dock.

The Sanitary State of Hackney.—Dr Tripe has presented to the Hackney Board of Works a report on the sanitary condition of the district. The public health of the district has not been quite so good as in the two previous years. Still, the death-rate is not so high as for all London. The population is estimated at 137,571, being an increase in the decade of nearly 40,000 persons. The density of the population has augmented in the same period from 22·8 to 34·9, and is increasing at the rate of one person per acre per annum. Dr. Tripe says that during 1875–6 a much larger mortality from scarlet fever must be expected. The river Lea has been, and is still, in a very bad state. The overcrowding cases at Hackney were not numerous, but some of them were very bad. The overcrowding was in all these cases quickly remedied.

Banbury Temperance Hall.—Tenders for this hall and buildings were invited from Banbury builders only, and sent in as follows:—C. Claridge, 2,375*l.*; J. & T. Davis, 2,383*l.*; T. & S. Orchard, 2,397*l.*; A. Kimberley, 2,686*l.*; T. H. Kingerlee, 2,875*l.* The committee were divided as to the choice of the lowest two tenders, the difference being nominal, and a consideration of certain matters between the committee and Messrs. Davis (who formerly occupied the property), influenced the decision arrived at to accept their tender as being practically the lowest, and not any preference as to the capabilities of the builders. When builders are invited no question of this sort should be entertained; the lowest tender should be accepted.

The New Law Court, Stafford.—On the 16th inst. was opened the new Police Court. It is more commodious than the old one, and this appears to be the only improvement. The approach to it is by a long, narrow, winding staircase, at the top whereof are two small doorways, and by this passage every one having business at the court must reach it,—magistrates, solicitors, policemen, and prisoners, together with the crowd of visitors, jostling one another *sans cérémonie* in the narrow entrance. The interior arrangements are in keeping with the approach. The accommodation for magistrates, solicitors, and reporters, is at present the same as heretofore. No rooms have been provided for witnesses in attendance or for the magistrates in which to retire to consider their decision.

The Dwellings of the Poor.—Dr. Hardwicke held an inquest on the 16th inst. at the Wellington Hall, Brooke-street, Holborn, on the body of Mary Ann Matthews, aged five weeks, daughter of a barber living at 22, Brooke-street. Mary Ann Matthews, the mother stated that the deceased was her first child, and they lived on the ground floor of the above address, using the front room for business purposes, and the back for a living and sleeping apartment. Mr. T. G. Davis, M.R.C.S., said the cause of death was suffocation from want of fresh air. The coroner said that the statistics showed that under such circumstances three if not four out of six children died, and but for having the run of the streets the others would soon follow. A verdict of "Death from accidental suffocation" was returned.

Explosion of Paraffin from Heat.—On Sunday night an explosion of paraffin occurred on the premises of Mr. J. Smith, oilman, situated at the corner of Rodney-street and North-street, Walworth, by which the basement was destroyed and the shop severely damaged. The explosion was caused by a leakage of paraffin, which ignited in consequence of the heat of the weather.

Shoreham.—A new R. C. church was opened here on the 11th inst. by Cardinal Manning. It is dedicated to St. Peter, and was erected at the sole expense of the Duchess of Norfolk. The church, built in the style of the latter end of the thirteenth century, is of flint with stone dressings, and will accommodate 400 worshippers. Its total length is 90 ft., of which the chancel occupies 30 ft. The altar is sculptured from Painswick stone. It is divided into three arcades, the centre one being filled by a representation of the release from prison of the church's patron saint; whilst symbolic designs, including the crossed keys, the sword of St. Peter, &c., are disposed at various parts. The church was built by Mr. R. Blaker, of Worthing, the architect being Mr. C. A. Buckler, of London. In close proximity to the church schools are being constructed.

Burwarton, Bridgnorth.—Rapid progress has been made in the building of the new church, by Messrs. George Smith & Co., of London, for in a few weeks' time the internal decorations will be completed. It is the gift of Lord Boyne, and is built of a warm-coloured stone, quarried from Burf Hill, close by, belonging to his lordship. The style is Gothic, with a square tower 70 ft. high. The west end of the church from the tower to the chancel is 88 ft., and from north and south aisle 56 ft. The stone carving is executed by Mr. Dayman, of London. The chancel and organ-chamber arches are supported by Purbeck marble supplied by Lord Edon. The reredos over the communion-table will be in mosaic. There are also carved sedilia supported by three marble columns. Mr. Salvin, of London, is the architect.

Building Scheme at Hipperholme.—It is proposed to establish a building-club at Hipperholme, for the erection of first-class dwelling-houses. The site is between the Leeds and Whitehall road and the Hipperholme tunnel, and has extensive views east and west, and large gardens or grounds to the front. Plans have been drawn by Mr. W. H. Howorth, and as the site is about 200 ft. in depth, and is well wooded, it will not only afford extensive but pleasant front grounds, whilst at the back there will be ample room for stables, &c. It is intended to erect two blocks, each containing nine houses, and that the cost of each house shall be between 500*l.* and 600*l.*

St. Stephen's, East Hardwick.—The chancel window of East Hardwick Church, Pontefract, is in the Early English style, and consists of three long narrow lights; the centre one has been filled with stained glass, representing events in the life of St. Stephen, and is the gift of pupils of East Hardwick school. It is proposed to place two figured lights one on each side of the St. Stephen light, to make the window complete. Parallel with the stonework of the window, and as a relief to the border, there is a line of semi-transparent glass set in squares, on which are shown small patterns of monograms, &c. Messrs. Edmundson & Son, of Manchester, are employed.

Burton-upon-Trent.—On Monday afternoon the two principal foundation-stones of the proposed new Wesleyan chapel and schools, Horninglow, were laid with the usual ceremonies. The site of the new structure is that of the old chapel and additional land in the rear, and the erection has been entrusted to Mr. Potter, of Horninglow-road, from plans prepared by Mr. Wills, of Derby. It is intended to accommodate 200 persons, and to be supplemented by two school-rooms and a class-room. The building will be of brick, with wrought Derbyshire stone dressings, and, with the cost of extra land, will represent an outlay of about 1,000*l.*

Proposed Restoration of Flyford Church, Worcestershire.—A meeting was convened by the rector of Flyford Flavell, on the 3rd inst., to consider what steps should be taken towards the restoration of that church. The following proposition was made and carried unanimously:—"That the body of Flyford Flavell Church be taken down and rebuilt; that landowners be applied to to assist in carrying out this object; and that those who have already promised to subscribe be applied to for their subscriptions, and that it be paid to the account of the Church-building Committee."

Iron Railing on the Holborn Viaduct.—The railing and gates in front of the City Temple, on the Holborn Viaduct, have been well executed by Messrs. Andrew Handyside & Co., of Walbrook.

Hadleigh.—The opening services of the Primitive Methodist new chapel and schoolroom here have been held. The chapel is a substantial red brick building, with white dressings to the doors and windows, and roofed with slate. There is a neat lobby; the benches have reclining backs; and there is also a rostrum. The floor is boarded. The chapel is lighted with eight circular-headed windows. The woodwork inside is finished with a light oak stain, varnished. Accommodation is provided for about 250 persons. The schoolroom is about 28 ft. by 14 ft. inside, carried up to the same height as the chapel, with bond, &c., for the ground-floor, when needed. It is fitted with gas, fireplace, cupboards, with provision for hot water for persons who may stay to dinner on the Sabbath, and for tea-meetings. The design of the buildings and specifications were by the Rev. M. Warnes, the late minister; and Mr. W. Baalham was the builder.

Improvement of Birmingham.—*On dit* that one of the newest projects for the improvement of Birmingham is one of the boldest that has yet been thought of. It is nothing less than an immense boulevard, which, stretching in a north-easterly direction from the neighbourhood of the New-street railway station, would sweep away a number of the "back slums" in its course, and give a wide and noble thoroughfare, bordered on each side with trees, &c., in the Parisian style, in their stead. The carrying out of this project, says the *Birmingham Gazette*, would also afford an opportunity for an extensive application of the Artisans' Dwellings Act.

A Window Improvement.—In the Sanitary Department of the Yorkshire Exhibition, Leeds, is exhibited what is called the "Sanitary Window," patented by Mr. J. James Cousins, banker. Besides the advantage of being free from rattling or shaking in stormy weather, the patentee says this window can be wound up with ease and quietness by a young child, whilst the strongest man is unable to force either sash up or down unless by using the key, the simple withdrawal of which firmly locks the apparatus. The window requires no pulley or cords, and obviates the nuisance caused by upper sashes getting out of order.

A New Unitarian Church at Coseley.—The opening services in connexion with the new Unitarian Church took place on the 10th. In October last, the building of the new church was commenced by Messrs. G. & F. Hyam, Wolverhampton, from plans prepared by Messrs. Bidlake & Fleeming, architects, of the same town. The new erection is in the Gothic style of architecture of the thirteenth century, and is built of stone. It affords accommodation for about 300 people. The total cost was about 1,600*l.*, all of which has been subscribed.

Sale of the Hotel du Louvre.—The immense block of buildings in the Rue de Rivoli, known as the Hôtel du Louvre, in Paris, was sold on the 14th inst. As had been previously announced, it was put up at 15,000,000 francs, and 2,500,000 francs for the goodwill of the business. M. Benoit, representing MM. Chanchard & Heriot, proprietors of the Grands Magasins du Louvre, bid 50 francs, and was declared the purchaser. The new owners are stated to have the intention of continuing the business as at present conducted. The costs are not included in the 17,500,050 francs.

Reduction in the Price of Gas.—Through the efforts of Mr. Applegate, the Trowbridge Gas Company's tariff has been reduced both to public and private consumers. The contract price for lighting the streets is to be 2*l.* 15*s.* per lamp, or a reduction of 5*s.* on each lamp. This will effect a saving of about 50*l.* in this year's contract. The price of gas to private consumers is to be reduced from 4*s.* 7*d.* to 4*s.* 2*d.* per 1,000 cubic feet, the reduction to take effect from the 1st of July last.

Gas Explosion at a Hospital.—An explosion of gas took place on the 16th inst., in the matron's room at the North Cambridge Hospital, Wisbeach. Two persons were seriously burnt, the windows were blown out, and great damage was done to the room. The explosion was caused by the porter, who, being called to an escape of gas, struck a match to look for it. When will people understand that to apply a light to escaping gas without first opening windows and doors, is the same as applying it to gunpowder?

Property and Trade Income.—In 1814 the gross value of lands and houses, &c., including quarries, mines, ironworks, canals, gasworks, and railways, in Great Britain, was 60,138,330*l.*; in 1844, 95,300,248*l.*; in 1854, in the United Kingdom, 124,871,885*l.*; in 1864, 161,397,345*l.*; and in 1873, 212,922,851. The gross annual incomes from trade, professions, &c. (excluding the provisions of 29 Victoria, cap. 36) were in the same periods,—from 1814 to 1873,—respectively 37,058,989*l.*, 65,095,191*l.*, 91,280,131*l.*, 124,075,550*l.*, and 197,237,339*l.*

Florentine Needlework.—In his "Ariadne Florentina," just published, Professor Ruskin gives a description of three pieces of Florentine needlework, which attracted his attention in the bedroom in which he slept at the King's Arms Hotel, Lancaster. The Professor, while staying at this old inn, was engaged in revising a lecture on "Design in the Florentine Schools of Engraving." It was in this inn, also, if we remember rightly, that Dickens and Mr. Wilkie Collins wrote one of their joint stories.

A Relic at the Thames Embankment.—The workmen engaged in clearing out the foundations for the new opera-house on the Thames Embankment at Westminster, have discovered, at a depth of 35 ft., a sword of curious workmanship. It is said to have a handle of gold, covered with heraldic engravings, and apparently of about the time of Edward II. or III. The blade is of fine Spanish temper, is straight, and double-edged, and is still sharp, although much disfigured with rust.

The Paving and Lighting of London.—Early next session Sir William Fraser will call attention in the House of Commons to the paving, lighting, and cleansing of London, and move that, in the opinion of this House, the parochial system is unsuited and inadequate to the reasonable requirements of the inhabitants of the metropolis, and that the subject deserves the immediate attention of Her Majesty's Government, with a view to remove by legislation the great evils that at present exist.

New Docks at Dundee.—A wet dock named the Victoria in honour of the Queen, was formally opened at Dundee on the 16th inst. by Lord Strathmore, the lord-lieutenant of the county. The new works have cost upwards of a quarter of a million, and the sum expended on the harbour from first to last has been nearly a million. Lord Strathmore said the Queen had intended to be present, but had been reluctantly obliged to forego the pleasure. Four launches took place, and the proceedings passed off with great success.

German Art Education.—An annual sum of 40,000 thalers has been granted by the German Government for the carrying out of the proposed project of having plaster casts taken of all the most important monuments of architecture and sculpture in Italy. The Italian Government has given permission for this work under certain conditions, one being that a copy of every one of the works reproduced should be given towards the formation of a museum of casts in Italy.

West Bromwich.—A new Town Hall and public buildings, comprising commissioners' offices, free library, open and covered markets, and public baths, erected at a cost of some 30,000*l.*, have been formerly opened at West Bromwich, when a dinner in honour of the occasion was given by Mr. R. Farley, the chairman of the Local Board of Improvement Commissioners.

The Science and Art Department.—We understand that the appointment of Art Director of the Science and Art Department, vacant by the resignation of Mr. R. Redgrave, R.A., has been offered by the Committee of Council on Education to Mr. E. J. Poynter, A.R.A., Slade Professor at University College, London, and are glad to hear that it has been accepted by him.

An Irish Home.—A sanitary officer from Clare reports having found ten human beings in a tottering mud edifice, 13 ft. by 7 ft. Seven slept in one bed, and a younger member in a hencoop. The roof was decayed and riddled with holes, and a dung-hill of putrid matter outside emitted a terrible stench. One child was quite naked. The family had been receiving out-door relief.

Extensive Alterations at the Hamilton Barracks, Scotland.—The policy adopted by Government in concentrating certain districts of the country into military depôts has led to great alterations in the barracks at Hamilton. The buildings for which contracts have been accepted by the War Office include quarters for fifty-six married soldiers. The total cost of the proposed additions is roughly stated at 20,000*l.*

New Wesleyan Chapel at Chesterton.—On the 16th inst. memorial stones of a new Wesleyan Chapel, at Chesterton, were laid. The chapel is being built by the Rose Hall Brick and Tile Company, from the designs of Mr. G. B. Ford, of Burslem, and it will seat 500 people. The entire cost, including 400*l.* for the site, will be 2,400*l.*

Monument to the late Mr. Platt, M.P.—Mr. D. W. Stevenson, sculptor, Edinburgh, has been selected to design the public monument,—a bronze figure with granite pedestal,—proposed to be erected at Oldham in memory of the late Mr. John Platt, M.P., the inventor and manufacturer of cotton-spinning machinery, to whom Oldham is indebted for a school of science and art.

Lighting Malmesbury Abbey.—This building is now lighted up with gas, the fittings and burners being arranged on the same principle as those of Gloucester Cathedral. The work has been carried out by Mr. Gough, of Westgate-street, Gloucester. The burners are placed in the cornice, above the pillars in the nave, and continue on both sides along the entire length of the building.

New Mission-room, Bradford.—Mr. B. Wood, of Frizinghall, has just had completed at his own cost a building to be called St. John's District Mission, which will be used as a day and Sunday school, and for the celebration of divine worship. The cost of the structure is about 1,800*l.*, and it will accommodate 330 children.

The Extension of the Western Piers, Swansea.—It was decided at the meeting of the harbour trustees, held on Monday last, that the important work of extending the piers another thousand feet will be forthwith proceeded with. The work will be carried out by the Harbour Trust themselves, and the total estimated cost is about 30,000*l.*

Want of Sewers in St. Pancras.—At a meeting of the St. Pancras Works Committee, on the 9th inst., Mr. W. B. Scott, the chief surveyor, reported that there was no sewer in Diana-place, Euston-road, and suggested a continuation of the sewers in the locality, at an expense of 440*l.*, which was agreed to, as also improvement of the sewerage in the Junction-road, at a cost of 460*l.*

New Schools in Kensington.—Princess Mary of Cambridge has laid the corner-stone of a second set of Church of England schools in the parish of St. Clement, Kensington Potteries. The schools are intended for about 700 children. The architect is Mr. F. Rogers, who expects to have the buildings completed at the rate of 3*l.* 10*s.* per child.

A Village Destroyed by Fire.—On the 13th inst. the village of Chudleigh Knighton, Devon, was in great part destroyed. Some children experimenting with a box of fusees set fire to a cottage, and before help could arrive not only was it entirely destroyed, but many others were much damaged.

The Old Baptist Chapel, Guildford.—The Old Baptist Chapel, in South-street, is being rebuilt with the addition of a schoolroom, and on the 13th inst. the memorial-stone was laid by Mr. W. Crowther, of Gomersall, Leeds. The building will cost about 700*l.* Messrs. Ayling & Jenkins are the builders.

Sowerby.—Increased chapel and school accommodation being required at Steep-lane Baptist Chapel, the congregation have erected and opened a new chapel to seat 600 persons, and a school, with class-rooms, to accommodate 350 scholars. The total cost of these has been about 2,500*l.*

The Foresters' New Hall, Bridport.—The foundation-stone in connexion with a Foresters' New Hall was laid on the 12th inst., by Mr. P. Ralli, M.P. for Bridport. For some time, owing to the large increase of brothers, there has not been sufficient accommodation at the old court-room, and hence this step was rendered necessary.

New Union Church at Lenzie.—A new church, built at Lenzie, for the use of the Union congregation, of which the Rev. Mr. Miller is pastor, at a cost of over 3,000*l.*, has been opened. The church is in the Gothic style, and has been seated in the area as well as in the end gallery, for about 600 persons.

The Management of Epping Forest.—Three important schemes have been forwarded to the Epping Forest Commissioners for the future management of the forest from the Corporation of the City of London, the Metropolitan Board of Works, and the Forest Fund Committee.

Norton Parish Church.—The tender of Mr. W. Fream, jun., builder, for the restoration of the ancient parish church of Norton, has been accepted. Tenders were sent in by three other firms. The work will be at once proceeded with, and is expected to occupy about four months.

The New King's School, Chester.—The large space of ground in front of the Town-hall, selected as the site for the new King's School, has been handed over to the contractor, Mr. Farrimond. On the 9th inst. the work was formally commenced.

Mr. Edward Newton, architect, of 104, Queen Victoria-street, E.C., writes to explain that he is not the Mr. Newton concerned in the case of "Newton *v.* the *Hornet*."

TENDERS

For warehouses, &c., in Clavering-place, for R. Robinson & Co., Newcastle-on-Tyne. Mr. J. E. Watson, architect:—

Whichillo	£4,850 0 0
Jackson	4,400 0 0
Scott	4,395 0 0
J. & W. Lowry	4,383 0 0
Simpson	4,327 17 1
Kyle	4,300 0 0
Norvel	4,234 0 0
Messrs. Mitchison	4,150 0 0
M'Mullan	3,966 1 4
Harbottle	3,964 19 10
Lee	3,809 9 0
Elliott	3,785 0 0
Grisdale (accepted)	3,718 0 0

For Long Eaton Working Men's Co-operative Stores, Derbyshire. Messrs. Robert Clarke & Son, architects:—

Hodson & Facon	£5,197 0 0
Slight	4,890 0 0
Jelley	4,913 0 0
Messom	4,749 0 0
Vickers	4,690 0 0
Slim	4,390 0 0
Duke	4,370 0 0
Poxen (accepted)	4,300 0 0

For the rebuilding of Moyriesk House, near Quin, county Clare, for J. F. Vesey Fitzgerald, D.L. Mr. W. Fogerty, architect. Quantities by Messrs. Gribbon & Butler:—

Gahan & Son	£2,800 0 0
Carroll	2,780 0 0
Wallace	2,680 0 0
Ryan & Son	2,591 0 0
J. & J. Hayes (accepted)	2,373 0 0

For works to premises, Burlington-street. Mr. S. Dyball, architect:—

Lister	£1,598 0 0
Abraham	1,584 0 0
Merritt & Ashby	1,548 0 0
Falkner	1,511 0 0
Kelly, Brothers	1,496 0 0
Scrivener & White	1,444 0 0
Rudkin	1,435 0 0
W. & F. Croaker	1,397 0 0

For villa residence, Sydenham. Mr. B. Fletcher, architect:—

Jerrard	£1,697 0 0
Fish	1,691 0 0
Brass	1,650 0 0
Kilby	1,620 0 0
Patrick	1,589 0 0
Hill, Higgs, & Hill	1,569 0 0
W. & F. Croaker	1,459 0 0

For repairs and alterations to St. Mark's Church, Tollington Park, N. Messrs. W. Waymouth & Son, architects:—

Dove, Brothers (accepted)	£745 0 0

For new Lecture Hall and alterations at the Strood Workmen's Club and Institute. Mr. Bulmer, architect:—

Ames	£1,050 0 0
West	900 0 0
Wilkins & Son	850 0 0
Callmed (accepted)	850 0 0
Sollitt	779 0 0

For basement story, coal vaults, and foundations to master's house, and men's infirm wards, at Marylebone Workhouse, for the guardians of St. Marylebone. Mr. H. Saxon Snell, architect. Quantities by the architect and Mr. Robert Griggs:—

Croaker	£2,230 0 0
Bamford	2,050 0 0
Aitchison & Walker	1,955 0 0
Wall, Brothers	1,897 0 0
Crockett	1,849 0 0
Hart	1,825 0 0
Dunkley	1,795 0 0
Timewell (withdrawn)	1,660 0 0

For new sewer between the London, Chatham, and Dover Railway and Southwark Bridge, in the City of London, for the Metropolitan Board of Works:—

Mowlem & Co.	£29,900 0 0
Webster	29,250 0 0
Nowell & Robson (accepted)	26,500 0 0

For alterations and additions to No. 85, Holland-road, Kensington. Mr. William S. Cross, architect. Quantities supplied by Mr. Joseph Waghorn:—

Kinninmont	£844 0 0
Howard	787 0 0
Richards	754 0 0
Weekes	625 0 0
Thompson	575 0 0

For the erection of a manufactory in Bromley, Middlesex, for Messrs. A. C. Engert & Co. Messrs. Hills & Fletcher, architects. Quantities supplied:—

Patman & Fotheringham	£5,250 0 0
Perry & Co.	5,198 0 0
Abraham	5,180 0 0
Sheffield	5,125 0 0
Wood	4,975 0 0
Bangs & Co.	4,725 0 0
Grover (accepted)	4,494 0 0

For alterations to East London Soap Works, Bow, for Messrs. Edward Cook & Co. Messrs. Hills & Fletcher, architects. Quantities supplied:—

Bangs (accepted)	£1,700 0 0

For additions to house in Bow-road, for Dr. Batteson. Messrs. Hills & Fletcher, architects:—

Craig	£169 10 0
Barrow	165 10 0
Selby (accepted)	150 0 0

For office fittings, 17 and 18, Basinghall-street. Mr. Wm. C. Banks, architect:—

	For new fittings.	Allowance for Old Materials.
Drew	£162 10 0	£22 10 0
Colls	157 10 0	7 10 0

For additions and alterations to "Glenthorne," The Avenue, Upper Richmond-road, Putney, for Mr. S. Merriman. Messrs. Karslake & Mortimer, architects. Quantities by the architects:—

Hobson	£760 0 0
Adamson & Sons	750 0 0
Aries (accepted)	731 0 0

For the erection of a detached residence in Upper Richmond-road, Putney, for Mr. R. Heath. Mr. S. Wood, architect. No quantities:—

Davies	£2,935 0 0
Aries (accepted)	2,547 0 0
Sutton	2,260 0 0

For new Presbytery, Tyler-street, North-East Greenwich. Mr. Henry John Hansom, architect. Quantities prepared by Mr. Henry Smith:—

Dove, Brothers	£1,695 0 0
Smith	1,599 0 0
Lathey, Brothers	1,520 0 0
Gregory	1,493 0 0
Tyerman	1,440 0 0
Beale (accepted)	1,118 10 0 !

For the erection of a cottage in South Penge Park, for Mr. Gilson. Mr. H. S. Benison, architect:—

Iles (accepted)	£600 0 0

For alterations and additions to the Lord Nelson, Nelson-square, Blackfriars-road (second tenders). Messrs. Ingram & Hollands, architects. Quantities supplied:—

Abraham	£759 0 0
Moreland & Nixon	730 0 0
Cook & Green	722 0 0
Patrick & Son	684 0 0
Harris & Wardrop	612 0 0
Hunt (accepted)	584 0 0

For erecting premises on the site of Nos. 68 and 69, Old Bailey, for Messrs. Larington. Mr. Thomas Renton, architect. Quantities supplied by the architect:—

Hill, Higgs, & Hill	£7,680 0 0
Newman & Mann	6,864 0 0
Morter	6,683 0 0
Scrivener & White	6,669 0 0
Nightingale (accepted)	6,647 0 0
Foster (withdrawn)	5,797 0 0

For new vicarage at Hampstead. Mr. T. K. Green, architect. Quantities supplied by Mr. Charles Poland:—

Burford	£3,159 0 0
Merritt & Ashby	2,999 0 0
Downs & Co.	2,980 0 0
Dove, Brothers	2,975 0 0
Browne & Robinson	2,970 0 0
Scrivener & White	2,900 0 0
Cowland	2,880 0 0
Waldram & Co.	2,856 0 0
Sharpington & Co.	2,832 0 0
Adamson	2,694 0 0
Newman & Mann	2,670 0 0

For new warehouse in Farringdon-road, for Mr. A. Burton. Mr. G. B. Williams, architect. Quantities supplied by Messrs. Franklin & Andrews:—

Turner & Sons	£10,881 0 0
Clemence	9,947 0 0
Conder	9,266 0 0
Ashby & Horner	9,100 0 0
Patman & Fotheringham	9,085 0 0
Macey	9,038 0 0
Ashby, Brothers	8,982 0 0
Lucas	8,965 0 0
Browne & Robinson	8,937 0 0
Coleman	8,888 0 0
Newman & Mann	8,834 0 0
Brass	8,664 0 0
Little	8,630 0 0

For alterations and additions to Nos. 44 and 45, King's-road, Brighton, and the erection of an Art Gallery and other works, for Messrs. Lewis & Sons. Mr. Thomas Lainson, architect. Quantities supplied by Mr. John George Gibbons:—

Barnes	£6,775 0 0
Newman & Mann	6,560 0 0
Merritt & Ashby	6,400 0 0
Cheeseman & Co.	6,130 0 0
Chappell	5,061 0 0

For dwelling-house and shop, No. 38, Hanway-street, Tottenham-court-road, for Mr. W. H. Parker. Mr. Alfred Skingle, architect. Quantities supplied:—

Weeks & Son	£1,180 0 0
Ellis	1,096 0 0
Scrivener & White	1,085 0 0
Newman & Mann	1,066 0 0
Deards	1,064 0 0
Niblett	1,041 0 0

For the formation of a new road, 70 ft. wide and 2,675 ft. in length, and sewer under, upon the estate of Sir John Maryon Wilson, bart., and Mr. Spencer Maryon Wilson, Hampstead:—

Anderson	£9,991 0 0
Hiscox	£9,500 0 0
Killingback	9,490 0 0
Watts	9,475 0 0
Nowell & Robson	9,225 0 0
Culverhouse (accepted)	8,987 0 0

The tender of Messrs. Guynan & Son (Oxford Steam Works), for the whole of the blinds to the Convalescent Home for Children at Norbiton (Mr. H. Saxon Snell, architect), has been accepted.

TO CORRESPONDENTS.

E. A. J. B. (an area 1,369 ft. by 700 ft. is not an incorrect expression. Information as to the new docks and extension works at Portsmouth is by no means willingly afforded).—Isca (the Building Act provides a mode of proceeding. Take proper advice).—J. D. & Sons.—E. W. T.—A. F.—W. B.—W. A.—J. C. H.—E. P.—J. M.—R. L.—H. H.—R.—J. B.—C. & Son.—M'L.—C. S.—H. B. W.—J. L.—B. A. P.—S. J. (in type).—J. K.—C. Z.—T. W. A.—S. & A.—W. C. B.—R. S. W.—J. G.—E. C.—J. S.—E. L.—C. Y.—W. B. (send particulars).

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